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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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VOL. CLXVI., No. 3184.] WEDNESDAY, MAY 21, 1924. [76TH YEAR.

EDITORIAL NOTES.

The Presidency of the Institution.

AMONG the minutes of the last meeting of the Council of the Institution of Gas Engineers is one which will be read with profound sorrow by all members of the gas profession. It is that Mr. James Paterson, M.A., the Senior Vice-President, has intimated his inability to accept nomination to the office of President for the ensuing year. To arrive at this momentous decision has, we are fully aware, caused Mr. Paterson many an anxious hour and considerable pain, as it had—naturally—been one of his ambitions in life to deserve, and if possible to gain, the highest honour that his professional colleagues could confer upon him. But events, throughout which he acted conscientiously and according to the dictates of intelligence, have left him (we hope only temporarily) without professional office in the gas industry. Hence the decision to which he has reluctantly come. But there will be consolation for him in the resolution which the Council have passed—a Council representative of the British gas profession in all parts of the country. There is a great deal of meaning and feeling in the words: "The "Council extend their fullest sympathy to Mr. Paterson "in the circumstances which compelled his decision," and express "their great regret that at this juncture he was "unable to consummate the distinguished service he has "rendered the industry through the Institution by accepting "nomination to the office of President." We join heartily in those sentiments. The laurels of the gas profession are not easily won; and when within grasp, to have them torn away by causes such as obtain in this case is enough to stir our deepest sympathies. Not only out of personal regard for Mr. Paterson, for his innate qualities and intellectual endowments, but out of long-time association and friendship with his father—Mr. R. O. Paterson—we regret this necessity on the part of the son to have to relinquish the Presidential Chair of the central professional organization. It was an office which the father filled with a grace, dignity, and brilliant accomplishment which were his inseparable attributes at all times, and which endeared him to executive officers and other men throughout the industry. We should have been delighted to see the son occupying the same distinguished office; but it is not to be—yet. We hope it is only an honour deferred.

However, the resignation has moved the Junior Vice-President forward to the senior position; and to Mr. J. Ferguson Bell, M.Inst.C.E., of Derby, we express very heartily our good wishes for a successful year in the office of President, in which position he is sure to be placed by a unanimous vote of the members. No one, we are certain, regrets more than Mr. Bell the circumstances that have deprived Mr. Paterson of the honour which he was within an ace of enjoying; and no one will be more sincere and cordial than Mr. Paterson in the hope that the close of Mr. Bell's year of office will find it coruscated with good results in work for the industry. Mr. Bell richly deserves the honour and the pleasure. He has always been an active spirit in, and supporter of, the co-operative work of the industry—professional and otherwise—and has made some classical contributions to its technical literature at the meetings of the Institution and the District Associations. We may particularly instance the stepping from light to heavy charges in horizontal retorts, which has had such beneficent effects for the industry. His official life, too, has been crowned with great success. There is another reason why our friend from Derby will have an enthusiastic welcome to the Presidential Chair. No one will forget the willing self-sacrifice he made in 1913—the Jubilee year of the Institution—when he, being the Senior Vice-President, resigned the coveted Presidency in order that the late Sir Corbet Woodall, then Governor of the Gas Light and Coke Company, might gratify the wish of the gas profession that he should be not only their leader but their official head in that historic year. The following year Sir Corbet did Mr. Bell the honour to propose, and Dr. Carpenter to second, his nomination as President. This was approved by the Council; but Mr. Bell did not at that time feel able to accept the position. We know that his many friends in the profession have time and again urged him to allow himself to be put forward for the office; and now, having (save the final stage) re-traversed the road leading to the Chair, he leaves his elevation to his professional colleagues. This he can do with confidence; friendship for him is widespread, and his record of energy in the interests of the industry assures that, all being well, he will omit nothing within his opportunities and power to promote those things which will advance the common weal of the industry, which it has been his pride and pleasure so long to serve, and of the members of the Institution individually. All his efforts are certain to receive the whole-hearted support of the members.

Since writing on this change in the immediate succession to the chair of the Institution, we learn that at the last Board meeting of the Derby Gas Company, the Chairman (Mr. W. Woolley) expressed, in graceful terms, the appreciation of himself and his fellow-Directors regarding the prospect of their General Manager and Engineer becoming so shortly the President of the Institution—an honour which, Mr. Woolley rightly says, is shared by the Company through their Engineer.

Formal Inspection of the Gas Exhibit.

THE thunderstorm in the early hours of last Wednesday was followed by a day of brilliant sunshine. Many rejoiced, and among them a couple of hundred gas men. It was the day appointed for the first formal or official inspection by the gas industry of the co-operative display at the British Empire Exhibition, and which is appropriately in the Palace of Industry, and a gem in the vast collection there. The gas industry has been learning how to do things in proper fashion. There is not now the seemingly half-hearted interest in the general affairs of the industry that there was in auld lang syne. There has been an adjustment to the new and more complex conditions, which require treatment different from the easy-going ways of the past. Testifying on Wednesday to the new zeal and spirit (which in other times were there, but latent, and had to be called forth) was not only the number of gas men, but their representative character—representative in official status and geographically. There were administrators—both company and municipal—engineers, secretaries, and sales managers, and there were the makers of gas appliances. We joined hands with the North of Ireland, with men from across the Border, with Wales, with the North of England, with the Midlands and the Eastern Counties, with London and its suburbs, and with many men from that large southern area stretching from Kent away to the far south-west. It was good to be with them, and good to hear their views. The opportunity was also taken to invite a number of Press men to see and to hear for themselves. But our interest lies at the moment

with the representatives of contributing gas undertakings and gas appliance manufacturers. We were curious to hear the opinions of those who saw the Gas Exhibit for the first time. The result was absence of adverse criticism, and unstinted praise.

The participants in the exhibit know that it has very definite objects; and one of them is not to show the processes by which town gas and the other products of coal carbonization are made in commercial form, stored, and distributed. The public are not buyers of such plant and processes. They might be interested in them from the educational point of view. What is of more intimate consequence to them is the purposes to which the products can be applied, and the best means of application. It is from that viewpoint that the Gas Exhibit has to be regarded either for praise or adverse criticism. In a word, the copartners in this exhibit who were able to be present on Wednesday were (so far as we heard) unanimously agreed that the whole scheme was well and truly laid, and the objects sought have been thoroughly met, which shows that the Executive Committee appointed for the purpose (with Mr. F. W. Goodenough as their Chairman) had wholly interpreted the wishes of those for whom they worked, as previously they had satisfied the members of the General Committee. The true proof of success, however, as we said last week, is not to be found in the opinions of gas men, but in the power of attraction and interest for the general public—whether concerned only in domestic economy and efficiency, or in industrial or trade activities which call for light, heat, and power. In this respect numerous inquiries have been already made, and new relations are being established between gas suppliers and householders and industrial firms who require something seen and approved at the Gas Exhibit. Engineers and managers tell us that in their far-away towns people, unidentified with the gas industry, have been to Wembley, have seen the display, have spoken highly of it, and have sought further information at home. This is the seed. These are the people who tell others what they have seen; and in the Gas Exhibit they inspect much that has abiding interest and effects.

Of course, one cannot but agree that the general public have a very vague conception of what the gas industry really is, and of how much it ministers to the needs of the community and industry. At the luncheon on Wednesday, the Chairman of the Gas Exhibit General Committee (Mr. D. Milne Watson) gave to the journalistic guests information in popular form which supplied comparative indication of the magnitude of the industry. That veteran Gas Engineer (Mr. H. E. Jones), who, despite his years, was as agile as the best of us in footing the extensive exhibition, also referred to the immense difference there is between gas application as he knew it in the olden days, and what it is, in multifarious form, in these times. However, we cannot expect the public to have a very fine conception of what the gas industry actually means, if appreciation of its potentiality is of poor degree among gas men. Sir Arthur Duckham fears that there are not a few gas men who are not particularly well instructed as to, or who have not a clear conception of, the spaciousness of the industry and of its prospects. We want in the industry to reinforce our knowledge, and to bring about a reformation of outlook. Large as the gas industry is shown to be by the data given by Mr. Milne Watson, if the men of the industry would regard all that as merely the foundation and beginnings of our industrial edifice, and that the building has now to be continued, by the best devised processes, then there would be intensified activity, and the systematic application of new methods to the work of realizing material advance. Sir Arthur Duckham looks upon the Gas Exhibit as marking a new era—the era of the Smokeless City; and in producing the Smokeless City, no more practicable means have been discovered than the combustible products of coal carbonization—gas and coke. When we think of 40 million tons of coal being used per annum for domestic purposes, and much more in industry which could be economically displaced by gas and coke, then the extensiveness of the gas industry's prospects and opportunities needs no further attestation. Accomplishment confessedly is something that is far off; but the rate of accomplishment will have large relation to the character and the degree of energy put into the applied effort to achieve. Let us hope, then, that the Gas Exhibit will be not only educative to the public, but an inspiration to all men in the gas industry—enabling them better to vision the largeness of the prospect, and successfully urging them to take all needful steps to build-up an industry and a service to mankind of dimensions of which hitherto we have not even dreamed.

The Institution Examinations.

The education scheme of the Institution of Gas Engineers is now well established; and the first examinations were held on the 3rd and 10th inst. From Mr. Walter Hole, the indefatigable Organizing Secretary to the scheme, we have received the questions set in each of the five divisions of the examinations, and have pleasure in reproducing them in other columns. This publication will be of considerable interest to students who are contemplating presenting themselves for examination on future occasions; and they will also show that work and study are very essential to gain the certification which will lead to future position in the industry. We are gratified with the number of candidates who presented themselves at this inaugural examination. There were 60—36 in Section I., and 24 in Section II. This indicates enthusiasm among those who are training for executive offices; and so long as this continues, the industry will have no fear that there will be a dearth of suitably qualified men, providing the industry itself does not underestimate their value. There were no candidates for the diploma in gas supply. That has to come, and will come, for it will be a much-coveted distinction; and we shall await with interest the names of the first men to gain it. The names of the first examiners deserve to be put on permanent record; for this is truly an historical event in the industry. They were: For Gas Engineering, Mr. H. D. Madden, M.Inst.C.E., of Cardiff; Mr. W. J. Smith, B.Sc., of Bolton, and Mr. J. S. Thorman, of London. In Gas Supply: Mr. S. B. Chandler, of Tottenham; Mr. Stephen Lacey, B.Sc., of London; and Mr. J. Wesley Whimster, of Bath.

Developing the Carbonization Process.

Some gas engineers have expressed the opinion that the principles of carbonization remain much as they were at the genesis of the process, and that the only advance that has been effected has been in the matter of detail. Few will be prepared to accept that as authoritative. The principles as they were known were crude compared with the principles applied to-day. The crude principles are undeniably at the base; but they have been entirely superseded by the aid of science, and in every part of the process, as is revealed by results—whether in volatile or other products, in fuel or heat consumption for a given amount of work, or in life of structure in relation to work done. One of the best papers we have read on the components of structure and practices that go to produce the perfect retort-setting, or as perfect as present knowledge enables it to be, is that submitted by Mr. Vernon E. Harston, of Norwich, at the recent meeting of the Eastern Counties Gas Managers' Association. The author has been technically schooled where carbonization is a matter of special detailed study, through the bent of mind of the chief, Mr. Thomas Glover. What he has found, what Mr. Harston has learned and experienced, all runs parallel with the issues of the work in the same direction of the South Metropolitan Gas Company, as presented in papers to the Institution of Gas Engineers and in Cantor Lectures at the Society of Arts—all of which, summed up, tells us that if the highest results in product and life, with economy, are to be secured from a particular type of setting, then not only must the design be studied, but every part of the structure must be of material the nature of which is best suited for its particular part and duty, and the methods of operation must be controlled with an exactitude conformable to the coal that is being carbonized, and to the results desired. The knowledge which enables these things to be done has accrued during more than a century's experience of coal carbonization for the production of town gas, and the rate of accretion of this knowledge has been greater during the past ten years than during any other previous decade within our experience, or of which we have read in the history of these matters. It is this growth of knowledge which has eliminated (so to speak) the early principles applied to coal carbonization, and has developed new ones. Weaknesses of design and construction have been removed by improvement in the physical characteristics of material, and by its appropriate disposition in the setting. Through the same means and improved methods, the heat treatment of the coal has been enhanced and placed under greater

regulation, with the result that production has been increased, and fuel consumption lessened in relation to the work done. When Mr. Harston is able to point to the enlarged yields realized, and to the advance in the average life of machine-stoked settings from 700 to 2000 days, and this despite the higher temperatures employed and the heavier character of the work done, then we have focussed in our minds the vastness of the progress that has been achieved, notwithstanding the view of some people that things are now much as they were before.

A point that a paper of this kind revives is that there is not throughout the industry that consistent application of knowledge and experience of carbonization construction and practices which ensures the universal attainment of the highest possible efficiency, and this altogether apart from the type of setting. There is still in some works low production, unnecessary destruction of valuable products, wasteful fuel use, and short life of settings. To what is this due—want of knowledge or indifference? It must be one or the other; and therefore anything inferior to the best possible results with any type of properly maintained setting and coal of given quality is a reflection upon the responsible person. Not long since we heard an engineer, who had been paying a round of visits to gas-works, say that he had come across some in which as much money was lost as there were profits made, and this through inefficiency —the product of causes which could be rectified. Think of what this means to the consumers, to an undertaking, and to the prospects of the latter in the matter of the development of business through a lower price per therm to the consumer! It is astonishing that these things should be; and it will be excellent for the industry when time, if there is not reformation, weeds out the incompetents and replaces them by men with the necessary knowledge, and the inclination and will to apply it. Providing the plant is not obsolete, and is worth the cost of improvement, then there is no reason why an approach should not be made to the best standards of working, because, after all, a horizontal or vertical retort plant, however large it is, is only built up of units —maybe larger units in the big works than in the smaller ones, but the smaller units should claim less supervision. There is another type of gas manager—who always regards efficiency from the aspect of the thermal product in gas, and more or less ignores all else. That again is a mistake. It was one of the lessons of the Cantor Lectures by Mr. E. V. Evans—that the original thermal value of the coal should be ascertained as well as the distribution of that value in the products of carbonization. The information not only provides a check upon working, but it is a guide to the control of the carbonizing operations according to the chemical and physical characteristics of the coal, and according to commercial requirements. As Mr. Harston points out, "the thermal efficiency of the process must not be allowed to blind us to its commercial efficiency and the difference in the selling price of the therm in the form of gas, tar, and coke." Of course, it is obvious that the therm in the form of gas is more valuable than in any other form, though one has to have some regard to the condition of the markets for each product. Speaking generally, the author says, "the gas therm is marketable at about six times the price realized for the therm as coke, and about four times that of tar."

All this is general. It arises out of impressions formed by the reading of the paper. The technical lines along which this ran first gave a succinct account of current knowledge as to the characteristics of refractory materials used in the construction of retort-settings. It was pointed out by the author that the term "refractory" is relative, as denoting such materials as will resist without fusion the temperatures to which they are to be exposed. It is, of course, absurd to purchase material of a quality exceeding the requirements for any particular part of the setting, or of the temperature to which the material will be subjected, just as it is absurd to purchase material below the quality necessitated by the temperatures to which it will be exposed. It is only by making due provision for each and every condition that economy, long life, and efficiency can be ensured. One of the definite points brought out by the author is that in practice it is found that small silica blocks are preferable to larger blocks for combustion chamber construction, &c., as they exhibit less tendency to expansion by reason of the conversion of the quartz property of the original siliceous material in the process of burning to tridymite and then to cristobalite; and the changes so effected are not reversible. Such blocks, too, are the more likely to be of homogeneous composition throughout, owing to the more perfect and even heat-treatment received during manufacture. The best materials to use in the construction of the different parts of a horizontal setting are mentioned by Mr. Harston; and then reference is made to the opposing requirements which retorts have to meet. In the opinion of the author, the segmental retort constructed in dense material of fairly high silica content offers the best compromise to the varying conditions which they have to satisfy. Such retorts may be more expensive to adopt; but they have advantages which justify this—such as ensuring the quality of the retort throughout its length, the distribution of contraction and expansion between a larger number of joints, the retention of shape throughout their life, ease in effecting satisfactory repairs, and relatively smaller leakage experienced, subsequent to preliminary firing. Passing to other structural details, a sloping bar grate is shown—sloping bar grates being the fashion now, in view of the smaller grate area required, the simplification of clinkering, and the reduction of the amount of unburnt coke to be removed during clinkering. This is distinctly a matter that is worthy the attention of smaller works, where generators or regenerators are in use. The remark is made in the paper that, from the standpoint of the rate of carbonization and carbonizing capacity, the filling of retorts with heavy charges for twelve-hour periods could not be justified were it not for the reduced decomposition of the products of distillation, the collateral advantages thereby obtained, and the saving in operation costs. To gain these advantages is an all-sufficient justification for the heavy charge. In this regard, in that of the materials of which the retorts are constructed, in that of heat transmission and the quantity of heat and fuel expended in relation to work done, and in that of the size or capacity of the retorts used, it may be that in time to come, when we have more positive information as to the effects of mixing a porous material such as coke with the coal, so as to effect quicker heat transmission through the charge and more rapid carbonization, Mr. Harston may find cause considerably to revise several parts of his paper, together with the modification of a number of currently approved principles in the matters of construction and operation. That is where in the vast amount of work that has been done in connection with carbonization, there has been failure. Attention has been concentrated on types of setting, the structural materials, and the methods of operation. But the question of whether by modifying the physical conditions of the heavy mass of coal (for the efficient decomposition of which all this work has been done) there could be further improvement, has been much neglected, though in recent years several suggestions have been made with this object in view.

There are many details on a large variety of matters in the paper, including particulars as to the carbonizing capacity of horizontal and vertical retorts, together with the thermal yields of products from horizontal and vertical retorts at Norwich, which show that the thermal yield of the latter is higher and the loss lower than in horizontal working. With a coal of 306 therms per ton, the loss in horizontal working is 14·71 therms, and in vertical working (8 p.ct. steam) 11·42 therms—the production in the form of gas being respectively 69·82 therms and 80·29 therms; as coke products, 202·18 therms and 190·34 therms; and as tar, 19·28 therms and 25·98 therms. From these data it will be seen that in vertical retort working, there were more therms in the form of gas, less as coke, and more as tar. The greater yield of tar is attributed not to more being made, but to less being destroyed. In the concluding part of the paper, Mr. Harston traverses in consecutive order the constructional details of a horizontal setting, which defines how in his experience and that of Norwich such a setting should be organized and built. The paper is an excellent one. There is real technical quality in it; and many in the gas industry may find profit in making a close study of its contents.

The Coal Position.

IT is hoped that the end of this month will see the ratification of the new agreement relating to mining wages by the delegate conference which has been called by the Miners' Federation. The new terms were arranged between the representatives of the Executive of the Federation and those of the Mining Association following the report of the Court of Inquiry over which Lord Buckmaster presided. The agreed official notification of the terms is reproduced in our

news columns to-day. It will be seen that the revision is in favour of the men, to the extent that the minimum wage rates are largely increased, and the position of the lowest paid workers is considerably improved. To meet these concessions, there has been a lowering of the percentage fixed charge to be allotted to the owners out of the proceeds of the industry. The new terms, if endorsed (as there is little doubt they will be), are to be retrospective from the 1st inst.; but the Executive of the Miners' Federation recommend that the agreement shall be for twelve months only, subject then to a month's notice from either side to terminate it. It must be recognized that this is not a final settlement. What it does mean is that, if approved, as the Federation Executive recommend it should be, the country will be free from a coal strike, which would be highly disastrous to the industrial world at the present juncture. But from the agreement nothing more than a period of repose must be reckoned upon. It may be that the conditions which are developed in the industry during the next twelve months will give the miners good ground for realizing that there are things which neither they, the coal owners, nor the Government can control. The export business is not showing any immediate inclination to return to the level from which it has descended; and among the possibilities is the one that, under the revised terms, certain pits and certain districts will be unable to continue to operate profitably. The owners can only look for brighter conditions coming to the relief of such pits and areas. There is a section of the Executive of the Miners' Federation who only look upon the settlement as a temporary one. They seem to regard it as little concern of theirs whence the money is to come with which to pay higher wages. What they are hoping is that within the next twelve months the nationalization of the mines will be an accomplished fact. They are optimistic. In the most favourable circumstances, it could not be done. Nationalization is a matter for the nation, and not for a section. And the nation's voice is rather loudly opposed to this socialistic scheme. The debate in the House of Commons last Friday was eloquent of this, and so was the rejection by 264 votes to 168 of the Nationalization of Mines and Minerals Bill, which was introduced to the House by a private member. There was a scathing criticism of the Bill by Mr. Lloyd George, who summed up its purpose by saying that Socialist-Labour was out for the organization of the mining industry as "a gigantic trust, with complete control of wages, prices, and distribution not in the national interests, but in the interests of one section of the community." The mining extremists make no secret of the fact that, if they could get the mines nationalized, then, should there not be sufficient money in the industry to meet their requirements, the public purse would have to supply the deficiency. They are really worse than those municipal authorities who run electricity undertakings at a loss, and make the ratepayers satisfy all deficits. If this sort of thing is to grow, it will perhaps be wise to find a more congenial place than Great Britain in which to live.

Visitors at the Exhibition.

Despite the bad weather during the opening weeks of the British Empire Exhibition, the turnstiles registered the first million during Saturday last, on which day there were, in round numbers, 150,000 visitors.

Staffing the Gas Exhibit.

The staff in charge of the Gas Exhibit is an experienced and fully qualified one. It is highly desirable that experience and qualification in the staff should be fully maintained during the whole run of the exhibit, and that the supply of the necessary attendants should not rest alone on two or three gas undertakings. It is work in which should be employed the services of the very best men the industry can supply. This being so, we hope sympathetic consideration will be given to the appeal made, in our "Correspondence" columns to-day, by the President of the Institution of Gas Engineers (Mr. Samuel Tagg). He suggests to those undertakings which have not already done so that they should communicate with the Gas Exhibit Committee, at 30, Grosvenor Gardens, offering the services of a member or members of their staff for such times as may be convenient. The unusual experience alone would be invaluable to such men; and the supply of attendants in this way would make still more pronounced the co-operative character of the display.

The Unknown Warriors.

When members of the Institution of Gas Engineers are in Paris, the President (Mr. Samuel Tagg) will, at 11.30 a.m. on Friday, June 27, place a wreath on the grave of the Unknown Warrior at the Arc de Triomphe. Simultaneously the Senior Vice-President (Mr. James Paterson) will deposit a wreath at the Cenotaph in Whitehall. The act of courtesy, sympathy, and admiration will be highly appreciated by our hosts in France, as their similar act was by us when a large number of the members of the Société Technique visited this country two years ago.

Internal Combustion Engine Committee.

In our issue for March 19 (p. 691), under the heading "Ignored," attention was called to the fact that the Institution of Gas Engineers had no direct representation on the Committee appointed by the Institution of Civil Engineers to consider questions affecting internal combustion engines. The minutes of the Council of the Institution of Gas Engineers now inform us that they have been invited to nominate four representatives to serve on the Committee. We are pleased that the matter has been so satisfactorily adjusted.

Why a Certificate?

One of our District Gas Associations confers upon its retiring President a gold medal; another Association has started giving a silver memento to its Presidents when vacating the chair; and now the Institution of Gas Engineers is going to hand a "certificate" to its Presidents on passing from the chair. What is the document going to certify? That the recipient has been a President of the Institution? Or that he had a highly successful year of office, and behaved himself as a President should while in the chair? Or that he enhanced the esteem in which he was held when the members honoured him by appointing him to the presidency? A better "certificate" than the "Transactions" of the Institution there could not be; and therefore, subject to a larger knowledge of what is proposed, at the present time a certificate, framed or unframed, appears to us to be superfluous, and not wholly in accord with the dignity of the office. What about the living links in that long line of Past-Presidents, many of whom did brilliant work for the industry? Are they to go without?

Assessment and Gross Receipts.

The Central Executive Board of the National Gas Council have done a very proper thing in advising certain gas undertakings which have been before an Assessment Committee to appeal against a new theory which has been enunciated for the purpose of arriving at the gross receipts in connection with the valuation of gas concerns. The grotesque idea is that, instead of taking the gross receipts as shown in the accounts, the actual quantity of gas sold should be multiplied by the statutory maximum or standard price; and the answer is—something arbitrary and not actual. It is so ridiculous as to be utterly contemptible.

London Traffic Bill.

It is satisfactory to learn that certain amendments to this Bill in favour of public utility undertakings have been accepted by the Minister of Transport. The minutes of the Central Executive Board of the National Gas Council state that such undertakings are to be informed immediately of all proposals submitted by road authorities for repairing streets; and they will be given an opportunity of making representations to the Minister in regard to them before any scheme is put forward by the Advisory Committee. Though satisfactory, this is only one amendment; there are others that should be made in the interests of gas supply. The National Gas Council are making further endeavours in this direction.

A Forty-Eight Hour Week.

At an early date, the Government are proposing to introduce a Bill to establish a forty-eight hour working week. The Ministry of Labour are preparing the measure, which, it is stated, will be in accord with the Washington Convention. Railway workers are to be exempt, as their case has already been dealt with by legislation. Where twelve-hour shifts are the vogue in the smaller gas-works, and eight-hour ones are not expedient, there should also be exemption. We might suggest the exemption of the working journalist, too, whose labour takes sharp upward and

downward flights. It might not be a bad thing, too, if there was a little levelling-up to the eight-hour day—say in colliery working and in Government Offices. With the forty-eight hour week, it appears that overtime is not to be allowed—save in case of accidents, or other emergencies, and then only for a limited period. Provision is to be made for the suspension of this legislation in cases of emergency. We wonder whether our Institution number would be looked upon as "a case of emergency." What with schemes for minimum wages and now maximum hours of work, heavy taxation, and a prospect of heavier still with the Government housing scheme and increased expenditure on other social projects, there will be no free-wheeling the country into prosperity. Several brakes will always be on. The position of the industrial worker will be considerably weakened by industrial enfeeblement.

Housing and Tax and Rate Payers.

Talking of the expensive schemes of the Government, and the prospect of more money having to be found by the tax and rate payers, it is seen that a circular-letter has been sent to the local authorities on the housing proposals of the Minister of Health (Mr. Wheatley). From this it appears that a vast expenditure of public money will be involved by the payment of a subsidy of £13 10s. per house for a period of forty years. The State contribution is to be fixed at £9, and that of local authorities at £4 10s. There are experts who say that the capital sum required for 2,500,000 houses will be upwards of £600,000,000, of which the State contribution will be about £402,000,000, and that of the local authorities £201,000,000. This is only one of the Government schemes, and it is quite enough to ponder over before considering others.

The M'Kenna Duties.

The result of the discussion on the M'Kenna duties in the House last week was that their abolition was confirmed by 317 votes to 252, despite the outcry of the men employed in the industries concerned. Since that decision, the President of the Board of Trade (Mr. Sydney Webb) has been visited by a deputation representing both employers and employed in the home gas mantle industry. Gas-mantles will lose their protection by the lapsing of the Safeguarding of Industries Act (Part 2). The deputation impressed upon Mr. Webb their deliberate view that the industry would be extinguished by the dumping of cheap imported mantles produced by workers receiving half the wages of British employees. Mr. Webb's trade union friends are anxious to maintain a high level of wages in this country; but the Government seem to have little notion as to how to confer upon industries the ability to pay those wages and to lessen unemployment.

Taking Counsel Together.

It is a pity there is not more conference between employers and the representatives of the employed in every industry on the subject of the conditions existing in it. A noteworthy departure from the old aloofness has been made by the Engineering Employers' Federation by inviting the Trade Unions connected with the engineering industry to meet them to consider how the present unsettled conditions might be avoided, and the stability of the industry as far as possible be secured. There was a hearty response by the Trade Unions to the invitation. The first meeting took place last Thursday at the Central Hall, Westminster. A lengthy statement was made by Sir Allan Smith in which attention was directed to the turnover of trade in the engineering industry during 1923, and to the state of trade on April 1 last. Reference was also made to the effect of foreign competition, foreign exchanges, and other matters which have a bearing on the conditions of trade at home. Mr. J. T. Brownlie, on behalf of the Amalgamated Engineering Union, made at some length a comment on the statement, after which the conference was adjourned until to-morrow. Good effect in the way of better understanding should accrue by such means.

The Co-Partnership Bill.

There is considerable unrest in industry. The tide of application for more money and revision of conditions of employment appears to be never ending. Industries are upset; there are long money-absorbing lapses in work through strikes, and much misery. All this under the present order of things, including trade-union rule. When so much trouble can exist, it is positively certain that present methods are wrong, and that the organized machinery is not working on the best principles. Where true co-partnership exists, there are minor troubles, but for years there have been no serious ones. Particularly is this true in the gas industry. But the Government—Labour-Socialist to the backbone—while not openly antagonistic to co-partnership, only regard it in a complaisant sort of way, and are not inclined to put themselves to even a little trouble to help it forward as the best solution known for obviating industrial unrest. It is an excellent preventive; and there is no reason why it should cause trade unions to go out of existence. It should, in fact, be one of their "jobs" to get it established. They have proved that they can be very helpful in many ways. However, the Companies Amendment (Co-Partnership) Bill, introduced by Viscount Cecil, has been read a second time in the House of Lords. Particulars as to the proposals of the measure were given in the "JOURNAL" for April 23 (p. 225).

PERSONAL.

Mr. D. J. EVANS has been appointed to the Secretaryship of the Aberystwyth Gas Company, following upon the retirement of Mr. W. J. Fearnsides.

Mr. A. E. BROOKS, the Engineer and Manager to the Ascot District Gas and Electricity Company, has completed 25 years' service in that capacity, having been appointed to the post on May 15, 1899.

Mr. J. E. MORFETT, Outdoor Manager to the Sunderland Gas Company (whose paper before the North of England Gas Managers' Association was published in last week's "JOURNAL"), is retiring, and will settle down at Chertsey. He has done useful public service for the last eleven years as a member of the Sunderland Board of Guardians and the Sunderland Rural District Council.

We understand that Mr. LEONARD ASKEW, who was associated for many years with the late Mr. A. F. Phillips, M.Inst.C.E., is continuing the practice in gas, water, and general civil engineering at No. 82, Victoria Street, S.W.1, formerly carried on by Mr. Phillips. Mr. Askew is taking into partnership his son, Mr. H. Royston Askew, B.Sc., Assoc.M.Inst.C.E., as his sole partner, under the title of L. Askew & Son.

Mr. G. W. SPENCER, Chief Clerk in the Fittings Department of the Sheffield Gas Company, was last Friday presented with a handsome cabinet of cutlery by the officials and staff, on his retirement after 47½ years' service. The presentation was made by the General Manager (Mr. Ralph Halkett), who spoke in high praise of the services rendered by Mr. Spencer, and said he was held in great respect by the officials, staff, and workmen of the Company.

OBITUARY.

SAMUEL SPENCER.

It is with sorrow that we have to record the death, on the 16th inst., at No. 8, Alfred Place, South Kensington, of Mr. Samuel Spencer, late of Tunbridge Wells, a Director of John Spencer, Limited, of Wednesbury, and of several gas companies—in fact, he had spent a great part of an active life in work connected with the gas industry.

Deceased, who was born in 1838, and was therefore in his 87th year, was the fourth son of Mr. John Spencer, of the Phœnix Iron-Works, West Bromwich. As long ago as 1854, he entered the service of the Horseley Iron Company, of Tipton, and went through every branch of the works of that large firm. For twelve years he was on the works staff, and for fourteen years he represented the Company in London. During this period he visited most of the gas-works in the kingdom. He was concerned in the building of a great many holders, and superintended the erection of the first four large ones put up by that firm, at Beckton, for the Gas Light and Coke Company. In 1878 he resigned, and joined, as his representative in London, Mr. John Spencer, who was then carrying on the business of an iron merchant and tube manufacturer. Mr. Spencer's family have been associated with the iron trade of Staffordshire for a century and more.

So far as his direct association with the gas industry is concerned, readers will not need to be reminded of the good work that he did in connection with the Colonial Gas Association, Ltd., of which he had been a Director since its inception, and Chairman for 28 years—until, indeed, it was decided, some months ago, that the control and management of the undertaking should be transferred to Melbourne. Much of the success that has been achieved by the Association must be placed to the credit of his enthusiasm, which was engendered by an unswerving belief in the potentialities of gas. He was a Director of the Croydon Gas

Company, having joined the Board when the Company acquired the Carshalton undertaking, of which he had been a Director for twelve years previously. In 1891 he joined the Board of the Singapore Gas Company, Ltd., in place of the late Mr. Robert Rice, becoming Chairman two years later; and this position he retained until the transfer of the works to the Municipality, which was completed in 1903. He was in 1922 elected Chairman of the Ascot District Gas and Electricity Company, in succession to the late Mr. Alfred Kitt. Mr. Spencer had been a shareholder in the Company since its incorporation, and a Director since 1909. The Woking District Gas Company also enjoyed the benefit of his services as Chairman. He was joint patentee with Mr. Good in a scurfing tool for gas-retorts.

Mr. Spencer was elected an associate of the Institution of Civil Engineers in 1878, and a member of the Court of Common Council for Vintry in 1894. The interesting announcement was made in the "Journal" for Oct. 3, 1911, of his appointment as Warden of the Founders Company—one of the old Guilds of the City of London.

The funeral was yesterday, at Tunbridge Wells.

The death occurred suddenly at his residence in Cardiff on April 16 of Mr. H. J. Bailey, O.B.E., F.I.C., the Inspector for Wales under the Alkali, &c., Works Regulation Act. He had not been well for a fortnight previously, but continued his work to the last.

Dr. F. Stroyan, whose death has occurred in a London nursing home, was elected a Director of the Aldershot Gas, Water, and District Lighting Company as long ago as 1895. In 1909 he was appointed Deputy Chairman, and this position he held up to the time of his death. He presided at the ceremony which took place in the Drill Hall, Redan Hill, some little time ago, when Mr. R. W. Edwards (the Chairman and Managing-Director) was the recipient of souvenirs on the occasion of his having completed 25 years' service with the Company. Dr. Stroyan was 64 years of age, and a highly esteemed citizen of Aldershot. He was a Justice of the Peace for Hants.

The death has occurred, at his residence, Borrowash, near Derby, of Mr. James William Newbold, a Director of the Derby Gas Company, and for some years Chairman of the Board. He was in his eightieth year. At the age of 21, he succeeded his father as Clerk to the Shardlow Board of Guardians, which position he held for half-a-century. He entered the Derby Town Council in 1879, became Mayor of the Borough in 1887, and at the expiration of his term of office was made an Alderman. He remained a member of the Council up to about a year ago, when he resigned. Since 1885 he had been a Justice of the Peace for Derby, and he was also a member of the Derwent Valley Water Board.

We are sorry to learn of the death, on the 12th inst. (at the residence of Mr. T. N. Ritson, "Glendene," Summersdale, Chichester), of Mrs. Hammond, widow of the late Mr. John Hammond, who was for many years Engineer and Manager of the Eastbourne Gas Company. Her eldest son, Mr. W. H. Hammond, succeeded his father as Resident Engineer and Manager of the Eastbourne Gas Company; her son-in-law, Mr. T. N. Ritson, Assoc.M.Inst.C.E., is Engineer and Manager of the Chichester Gas Company; her son Alfred is in the employ of the Bournemouth Gas and Water Company; and her stepson, Mr. J. E. Hammond, is Engineer and Manager of the Lewes Gas-Works.

Light Oil Composition and Gummy Deposits.

Mention was made in the "Journal" for Dec. 12 last [p. 719] of a United States Bureau of Mines report regarding investigations into the matter of gummy deposits from carburetted water gas, in which were given the results obtained in a study of the variation in composition of the light oil from three typical gas oils, when cracked in an atmosphere of blue gas under identical conditions. Messrs. Ralph L. Brown and Henry G. Berger (both of whom were concerned in the preparation of the report referred to) contributed a paper dealing with the same subject to the proceedings at the recent meeting of the American Chemical Society. In this, it was pointed out by them that, from basic data secured entirely from actual apparatus, it has been found that thorough cracking of gas oil in carburetted water-gas plants furnishes a light oil composition in the gas which gives little condensate (drip oil) and gummy material in the distributing systems, and this near the plant, because the light oil is high in benzene and toluene—highly volatile constituents—and low in high-boiling constituents and gum-forming ones—indene and styrene—which give rise to most of the gummy deposits. The degree of cracking increases with increase of temperatures, with decrease in rate of oil input, and with increase of the closeness of checker-brick spacing—all within the respective ranges of practical operation. Since it is possible for a gas thoroughly condensed at the plant to yield a condensate and deposits in cold meters, the true point of control is in the operation of the carburetting units, as evidenced by two plants cited as examples, in which good cracking from the light oil standpoint is being secured, and which rate high in cracking efficiency as well. The findings from plant data confirm fully the authors' previous work on a laboratory scale.

NATIONAL GAS COUNCIL.

Central Executive Board.

The Central Executive Board of the National Gas Council held their usual monthly meeting at No. 30, Grosvenor Gardens, London, S.W., on Tuesday, May 13—Mr. D. Milne Watson in the chair.

The Late Mr. A. F. Phillips.

The Chairman announced with great regret the death of Mr. A. F. Phillips, who had been a most loyal supporter of the Council. A vote of sympathy was passed, all the members standing.

London Traffic Bill.

It was reported that, although the Council, in common with other public utility services, had been unable to obtain direct representation upon the Statutory Committee dealing with this Bill, the Minister of Transport had accepted amendments, the effect of which was that public utility undertakings would be informed immediately of all proposals submitted by the road authorities for repairing streets, and would be given an opportunity of making representations to the Minister in regard to such proposals before any scheme was put forward by the Advisory Committee.

Further amendments which the Council are endeavouring to obtain to this Bill were reported.

Rating of Land Values (No. 2) Bill.

It was reported that this Private Bill would, if passed, have the effect of altering radically the existing law of rating. The Bill proposed, *inter alia*, (1) that future rates should be levied upon the annual land value—viz., 5 p.ct. of the capital land value, as defined in the Bill; (2) that all existing or future machinery should be exempted from rating unless permanently attached to the hereditaments; and (3) that gross assessments should be abolished.

It was arranged that the Council should follow the course of this Bill, and that if necessary it should be considered by the Special Committee who are dealing with the Draft Rating and Valuation Bill.

Assessment of Gas Undertakings.

It was reported that, in a recent appeal before the Assessment Committee by certain gas undertakings, a new theory had been enunciated for the purpose of arriving at the gross receipts in connection with the valuation of gas undertakings. Instead of taking the gross receipts as shown in the Company's accounts, the suggestion was that the actual quantity of gas sold should be multiplied by the statutory maximum or standard price for gas.

It was decided that the Companies in question should be advised to appeal.

London and Home Counties Electricity Scheme.

It was reported that the local inquiry into the Draft Order and Scheme prepared by the Electricity Commissioners in regard to London and the Home Counties opened on May 5, and that the Council, in conjunction with the British Water-Works Association, had lodged objections against a clause in the Draft Order which proposed to confer upon the Joint Electricity Authority powers to "lay down, maintain, repair, alter, and use pipes for conveying water or gas or any materials, matters, or things used by them in, or resulting from, the process of generating or transforming electricity to or from any generating station of the Joint Authority."

For the purpose of this clause, it was proposed to confer upon the Joint Authority the power to break-up streets. The effect of this clause would have been still further to congest the streets with gas and water pipes which would serve no public purpose, and would tend to increase the difficulties already experienced by statutory undertakings in finding accommodation for mains which they are compelled to provide.

The first point taken in the objections was that, in view of the limitations imposed by section 15 of the Electricity (Supply) Act, 1919, the whole clause was *ultra vires*. This point was argued before the Commissioners, and as a result the Commissioners decided to delete the clause.

Modern Bye-Laws and Regulations for the Prevention of Contamination, Waste, or Misuse of Water.

It was reported that, after a further meeting between the Council's Committee dealing with this question and the Sub-Committee of the Ministry of Health, the Ministry had so amended their specification as to meet all the reasonable requirements of the industry. A copy of the revised specification will appear in the Council's "Monthly Report."

Port of London Rates.

It was reported that, as a result of protests made to the Ministry of Transport and to the Port of London Authority against the exorbitant increase in the rates on coal discharged into the Port of London, the Council were able to announce that a reduction of ½d. a ton had been agreed. This meant an increase of only ¼d. per ton on the rate in force up to April 1. The agreed rate applied to all sea-borne coal entering the Port of London, and affected coal consigned to many gas undertakings situated in the Home Counties, as well as London.

Mining Subsidence.

It was reported that the Royal Commission had announced

their intention of visiting South Wales on June 20 and 21, in order to inspect damage caused by mining subsidence.

GEYSER SPECIFICATION.

A report, specification of suggested constructional features to be embodied in the manufacture of geysers, and instruction book in connection with the fixing of them, which has been prepared by the Council's Gas Appliances Specification Committee, were submitted. It was decided that this matter should come up for consideration again at the next meeting of the Central Executive Board.

SMOKE ABATEMENT LEAGUE OF GREAT BRITAIN—MANCHESTER CONFERENCE.

It was unanimously agreed that the Council should become patrons of the Manchester Smoke Abatement Exhibition and Conference to be held at the City Hall, Deansgate, Manchester, in November next. The object of the conference was the examination in as practical a manner as possible of all avenues of escape from smoke.

AGRICULTURAL EXPERIMENTAL STATION AT ROTHAMSTED.

It was reported that Sir John Russell, the Director of the above Experimental Station, and his colleagues, had invited members of the British Sulphate of Ammonia Federation, Ltd., to visit Rothamsted on July 10, to inspect the work being done there. The General Manager of the British Sulphate of Ammonia Federation had kindly extended the invitation to members of the National Gas Council, who would be officially advised through the Council's "Monthly Report." Members of the Council are requested to notify the Secretary at an early date of their intention to accept the invitation, in order that adequate arrangements may be made.

ELECTRICITY SUPPLY MEMORANDA.

THE Electricity Commissioners are now holding a third inquiry in connection with their scheme for a Joint Authority for London. It is a difficult problem, owing to the long-reigning conditions and rights of the present suppliers. But the Commissioners have not been very happy over their proposals. Their last attempt at co-ordinating and composing the various interests led them to the Law Courts, where they learned that, in the eyes of the law, their scheme was *ultra vires* in certain respects. The London County Council have since been busy negotiating with the electricity companies, with the result that (we understand) most of the companies have approved the principle of the application of a sliding-scale of price and dividend—much on the lines of the South Metropolitan Gas Company's plan of basic price and dividend, below which dividend there will not be descent so long as profits suffice, but which will rise and fall above the basic rate with the reduction or increase of the price charged for electrical energy. The decision as to something having been introduced into the previous scheme which was *ultra vires*, has caused a modification in the representation on the Joint Authority. Another important point is that, in the areas of the London Companies, centralization of generation is to be secured by either the transfer or the lease of the works to a new company, or by the amalgamation of existing companies, instead of by the transfer or lease of the undertakings to the Joint Authority. It is proposed that a Technical Advisory Board shall be established; and the purchase powers of the County Council over the London Companies are to be suspended from 1931 to 1971. The proceedings have brought the Commissioners again into close touch with the Law Courts. The Hornsey, Finchley, and Walthamstow Councils, through Mr. Montgomery, K.C., objected to the technical scheme being attached to the Order, and to the proposal to establish a Technical Committee under the Order. Counsel argued that both these points are *ultra vires;* and if they are not expunged from the Draft Order, he will go to the Courts, and submit that they are *ultra vires*. Sir John Snell pointed out that the Commissioners have been advised that these matters are in order, which led Mr. Montgomery to suggest that they are unfortunate in their legal advice. For West Ham, Sir Lynden Macassey, K.C., advised the Commissioners to jettison the technical scheme and the Technical Advisory Committee; and there is no question that he is practically agreed with Mr. Montgomery as to the proposals being *ultra vires*. The Commissioners cannot disregard these expressions of opinion from such eminent legal luminaries. Sir John Snell tried the effect of something tantamount to a compromise. He offered, in order to avoid litigation, to alter the technical scheme, so that any local authority who wished their station removed from the list can do so, and so will not be brought within the scheme compulsorily. In regard to the Technical Advisory Committee, he said it is proposed to make the appointment of this permissive and not compulsory. But this has not removed the objection; and Mr. Montgomery may yet have to press for the complete exclusion of the technical section of the scheme. The Electricity Commissioners are mightily unfortunate in their efforts to please everybody—including themselves.

Electricity Authority for London.

An Excessive Proposal Withdrawn.

There was a matter, too, in which the London Gas Companies were immediately concerned, and, in fact, the gas industry generally; for it sometimes happens that when a precedent is set for London, it spreads into the provinces. The matter was argued on behalf of the South Metropolitan Gas Company; and they were successful in securing an amendment, which also satisfied the National Gas Council, who were in opposition on the same point. The matter was the subject of a report in last week's issue. Here the Commissioners had to acknowledge that it was possible to put upon the clause to which objection was taken the construction submitted, through their Counsel, by the South Metropolitan Company. But it seems that, although the clause in question was open to the construction placed upon it, it did not represent the intention of the Commissioners. The clause proposed to give the Joint Authority power "within the district, to lay down, maintain, repair, alter, and use pipes for conveying water, gas, or any materials or matter, or things used by them in, or resulting from, the process of generating or transforming electricity, or from any generating station of the Joint Authority." Later on, it was provided that "nothing contained in this paragraph shall authorize the Joint Authority to supply water or gas to other persons within, or for use within, the statutory limits of supply of any company or authority supplying water or gas." It was submitted by Counsel (Mr. J. W. Jowett, K.C.) that the clause was *ultra vires;* and our report of last week gives an account of the reasons adduced—the main one being that the clause went beyond the powers in the Electricity Supply Act of 1919. Under the clause as it stood, there was nothing to prevent the Joint Authority setting up gas-works, supplying their own electricity works, and breaking-up streets for laying mains without the approval of anybody. There was nothing which could prevent the Joint Authority from running pipes through the area of the South Metropolitan Gas Company to supply gas to somebody on the other side. It is clear that, not until the explanation was made as to what were the legal powers they were proposing to confer, the Commissioners did not appreciate their full purport. The Chairman explained that the object in mind was to allow the Joint Authority to lay pipes for condensing and circulating water purposes and the like, which seems to us rather a narrow meaning to attach to the words employed. However, having regard to section 15 (2) of the Electricity Supply Act of 1919, the Commissioners withdrew the offending clause; and this gives satisfaction to the gas companies, and hurts no one. The position is as it was when the 1919 Act was passed. The province of the Commissioners is not to create new legislation, or to take more licence than is expressly allowed them by the Acts under which they operate. But, singularly, they seem to have some difficulty to confine themselves to the powers with which they have been invested.

Thermal Efficiency in Generation.

Electrical engineers are paying lively attention to the question of thermal efficiency in generation. They have good reason to do so, as no scientific worker can be at all proud of the low efficiencies that are usually found in electricity generation. The Barton power station which Mr. H. N. Allott and Mr. S. L. Pearce described in a paper before the Institution of Civil Engineers the other week, is in a position thermally to hold its head high among other power stations; but after all, it does not seem much to boast about when a process, under the very best of conditions, loses 80 p.ct. of heat in securing 20 p.ct. of heat in another form of energy. That is what Barton is doing; and it is held up as an example to be emulated. The gross calorific value of the fuel used is 10,970 B.Th.U. The B.Th.U. expended per KW.-hour generated is 16,506; the B.Th.U. expended per KW. of output is 17,100; and the fuel per KW. of output is 1¾ lbs. The over-all efficiency is 20 p.ct. This puts the station in the position of being the best in the country. An analysis of the costs per KW. delivered to the feeders is as follows: Fuel, 0·141d.; oil, water, stores, 0·006d.; wages and salaries (operation and administration), 0·031d.; wages and materials (repairs), 0·005d.—total, 0·183d. Adding capital charges, 0·165d., makes 0·348d. Be it marked, this is only the cost delivered at the feeders. "Meteor" of the "Electrical Times" says this outstanding feature of Barton, with its all-British equipment, seems likely to establish a world-record in thermal efficiencies. Why should it not do so? From the remark, it would seem that in electrical circles little hope exists of exceeding round-about 20 p.ct. efficiency, which is a poor result, scientifically regarded.

The 100 P.Ct. Fallacy.

An old contention of ours, which has been consistently denied by electricians, is that the electrical submission that electric "fires" or radiators have 100 p.ct. efficiency will not stand the test of accurate measurement. Several types of electric fires have at various times been tested by interested people for their radiant efficiency; and the results have been widely different. We have at last acknowledgment of this from "Megohm," of the "Electrical Times." He positively says that a 2-KW. electric fire of one make will often give out more heat than a 2 KW. fire of another type. He says it is true that all the electrical energy is converted into heat; but it depends on the design of the radiator how much of the heat will be retained by

the apparatus itself, and simply be expended in raising its temperature, and how much will be carried into the room either by radiation or convection. He points out this is why the old type of radiator with its sausage-shaped lamps is much less efficient than an electric fire of modern design. Then our friend goes on to suggest to "those who have to deal with gas arguments on the therm basis that it is convenient to remember that, for the purpose of carrying off the fumes which are the products of combustion (and also the surplus gas and carbon monoxide arising from incomplete combustion), a by no means insignificant proportion of the heat generated has to be utilized for ventilation." We invite "Megohm" to tell us what is that proportion; also what it represents in the matter of cost at 8d. or 9d. per therm; and how the balance of the heat usefully given off compares in cost with a similar quantity of heat furnished by electricity at (say) 2d. per KW.-hour. Will he at the same time supply some information as to carbon monoxide from gas-fires? And it would be useful if he could extend the particulars to making comparison with the carbon monoxide found in the products of combustion of coal, which is still used in the houses of so many electrical men, who cannot afford to employ electricity for all heating purposes in winter. We shall be interested if he will favour us with data on these various points.

Lighting at Wembley.

We understand that the electric lighting—spectacular and otherwise—at the British Empire Exhibition is still in an incomplete state. The "Electrician" in a reference to the matter says: "We have been told so often that the artificial lighting of the interior and the exterior of the buildings at Wembley was to be something so out of the ordinary in technical correctness and beauty, that we are not surprised at the vigorously expressed disappointment at its present inadequacy." It appears, however, that most of the criticism has come from engineering visitors, and that the public are not aware that things are by no means yet up to the standard that has been arranged for. We deny that. "Very poor" is the verdict of a visitor (neither gas-man nor electrician) after a visit last Friday evening. Our contemporary admits the inadequacy, and says it is so because it is not, and cannot yet be, finished. The reason attributed is the shortage of jointers. Why were not the requirements of this special occasion properly legislated for? That is a matter which requires looking into. Some one seems to have blundered.

A Heavily Opposed Scheme.

There have been many electricity supply schemes proposed, recommended, and adopted, which have proved financial failures. They have fallen far short of the predictions of their sponsors in respect of the rate of development, and profit accretion. The accretion has oftentimes been on the side of loss. A difficulty, of course, is that it is rarely that there is anybody on the smaller provincial local governing bodies capable of deciding upon technical matters and assessing commercial probabilities in respect of untried ventures in their particular circumstances. Truro is seeking to borrow £14,000 to carry out an electricity scheme, under which the Council propose to take a supply from the Cornwall Electric Power Company. The agreement, we gather, contemplates a supply at 2¼d. per unit for five years. Other schemes, it seems, have been suggested; but the Council have turned them down, presumably because they emanated from private enterprise. The ratepayers appear to be divided in opinion regarding the scheme. We are not surprised. The pronounced character of the division was brought out at the public inquiry which was held, on behalf of the Electricity Commissioners, by Col. T. C. Ekin; and we rather anticipate the ratepayers will have their confidence further shaken by the disclosures of the evidence. It is admitted that there would be a loss the first year. This is usually the case, and is expected. But there were suggestions, which were advanced or supported by no less an authority than Mr. A. Hugh Seabrook, that the system of supply proposed was not a suitable one, that the financial estimates were open to question, that losses of current from the distribution system had not been properly considered, that the estimate made of an average consumption of 498 units per consumer is excessive. The opposition was strong; the criticism that was made of the scheme severe. Among the objecting ratepayers were the Gas Company, whose Managing Director (Mr. S. J. Ingram) gave evidence. The Company have no objection to the introduction of electricity into the district; but they do—and naturally—object to the rates, to which they contribute, being used to bolster up competition with themselves, and they are not sympathetic to a scheme which, to their mind, threatens losses. They prefer that the supply should be given by a company, so that there would be no need to have recourse to the rates. Mr. Seabrook, the technical witness for the opposition, preferred that a private company should undertake the supply. There was an attempt, on the part of the promoters of the scheme, to place upon the Gas Company the honour of being the moving power in the opposition; but this failed. The Company denied it; and Mr. Wallace C. Smith, the Chairman of the Ratepayers' Committee, declared there was not a single word of truth in the suggestion, nor were the Company financing the opposition.

Association of Statutory Inspectors of Gas-Meters.—The annual general meeting of the Association will be held in the County Hall, Westminster, on Wednesday, June 18.

THE INSTITUTION OF GAS ENGINEERS.

Council Meeting.

A meeting of the Council was held at No. 28, Grosvenor Gardens, Westminster, on Monday, May 12—the President (Mr. Samuel Tagg) in the chair.

With reference to the arrangements for the forthcoming annual meeting, it was reported that the Minister of Health would consider an application from any local authority whose accounts are subject to Government audit, and who own a gas undertaking, for sanction to the payment of the reasonable expenses of two delegates attending the meeting, of whom one should be the gas engineer.

In regard to travelling facilities, the railway companies have agreed to issue tickets at the ordinary single fare *plus* a third for the double journey, on the usual conditions.

It was agreed that the representatives of the Institution on the National Illumination Committee of Great Britain be appointed on the Sectional Committee on Illumination of the British Engineering Standards Association. The report by Mr. Robert Watson of the Conference, at which it had been decided to establish this Sectional Committee, and the Annual Report of the National Illumination Committee for the year 1923, were received.

In response to the request for the appointment of a representative on the Screw Threads Committee, Mr. Stephen Lacey was nominated. The resignation of Dr. Carpenter as the Institution's representative on the Cast-Iron Pipes Committee was accepted, and the Council expressed their thanks for the services he has rendered in that capacity.

The report of the conference convened by the Chartered Institute of Patent Agents on the subject of Patent Office procedure was presented by Mr. Thomas Goulden, delegate of the Institution. The Comptroller General of Patents has been asked to receive a deputation from the conference.

Announcement was made of the deaths of Mr. W. D. Hunter, Mr. Philip Monson, and Mr. A. F. Phillips. The Council signified their regret at the loss of these members, and their sympathy with the bereaved.

Nominations.

The following names were approved for the ballot list. As candidates for the class of "Member": Messrs. George R. Anderson (Gas Light and Coke Company), Barton Arnold (Knottingley), John H. Chew (Blackpool), Thomas E. Furniss (Guisborough), Percy C. Gardiner (Tottenham), John K. Harrison (Armagh), John F. Haseldine, M.C. (Barnet), Alexander L. Robertson (Wigton), James J. Scott (Cowdenbeath), and William Wilson (Antwerp).

As candidates for the class of "Associate Member": Messrs. Charles Bateman (Cardiff), Fred. Bedford and William T. Hallam (Singapore), John Lupton (Windermere), Arthur L. Norton (Redditch), Frank Rudge (Leicester), Harold Taylor (Birmingham), Charles D. Terry (Leamington), and Bertram N. Wells (Margate).

Mr. William A. Howie (Gravesend) and Mr. William H. Reed (Warwick) were transferred from the class of "Associate Member" to "Member;" and Mr. Alexander G. Grant (Leeds), Mr. R. W. Hilham (Gorleston), and Mr. William H. Noble (Lea Bridge) were admitted as "Students."

The nomination for the year 1924-25 of President, Vice-Presidents, Hon. Secretary, Ordinary Members of Council, and Auditors was proceeded with.

Withdrawal of the President-Elect.

A letter was read from Mr. James Paterson, Senior Vice-President, intimating his inability to accept nomination for the office of President for the ensuing year. The Council extend their fullest sympathy to Mr. Paterson in the circumstances which compelled his decision, and expressed their great regret that at this juncture he was unable to consummate the distinguished service he has rendered the Industry through the Institution, by accepting nomination to the office of President.

Miscellaneous.

It was reported that Mr. Leonard J. Langford, of Tunbridge Wells, has been elected District Member of Council to represent the Southern Association of Gas Engineers and Managers for the year 1924-25, and that Mr. S. Shadbolt, of South Bank, has been elected to represent the North of England Gas Managers' Association for the same period.

A report on the Education Scheme by the Organizing Secretary, Mr. Walter Hole, was received. The general conditions for the special admission to the Institution of those who obtain the Diploma were considered and approved, with a view to the matter being submitted to the members at the forthcoming annual meeting.

The arrangement of the programme for that meeting and of the subsequent visit to Paris at the invitation of the Société Technique de l'Industrie du Gaz en France was approved.

A wreath is to be placed on the grave of the Unknown Warrior at the Arc de Triomphe, Paris, at 11.30 a.m. on Friday, June 27, by the President of the Institution; and at the same hour the Senior Vice-President will deposit one at the Cenotaph in Whitehall.

The design of a Certificate recording the President's occupancy

of the chair of the Institution, for presentation each year, was placed before the Council, and passed for execution.

An invitation for the Institution to nominate four representatives to serve on the Heat Engine and Boiler Trials Tabulation Committee of the Institution of Civil Engineers, on similar terms to the other Institutions represented thereon, was accepted.

In response to the invitation from the Kelvin Centenary Committee of the Royal Society, it was decided to appoint Mr. J. Ferguson Bell as the representative of the Institution on the Committee of Honour which is being formed in connection with the celebrations fixed for July 10 and 11 next.

The nomination was confirmed of Mr. W. J. A. Butterfield and Mr. Robert Watson as delegates of the National Illumination Committee of Great Britain to the next meeting of the International Commission on Illumination, which is to be held at Geneva from July 21 to 25 next.

It was decided to accord the patronage of the Institution to the Smoke Abatement Exhibition and Conference to be held at the City Hall, Manchester, in November next, under the auspices of the Smoke Abatement League of Great Britain.

A summary was presented of the Report of Prof. John W. Cobb, Livesey Professor at the Leeds University, setting forth the work which has been carried out during the session 1922-23. The Council cordially expressed their appreciation of the highly satisfactory results achieved through the training given.

It was stated that the report of the Sub-Committee on Standardizing Tests of Gas-Cookers is in course of completion for presenting at the next meeting of the Gas Investigation Committee.

The report of the Finance Committee was presented, accepted, and adopted.

EVENING STAR CHAPTER, No. 1719.

Installation Convocation.

The Evening Star Chapter (No. 1719) held their 1924-25 installation convocation last Thursday, by dispensation from Grand Chapter, at Freemasons' Hall, Great Queen Street, London. Ex-Companions Arthur Valon, F. C. Tilley, and H. W. Packham presided.

After the usual preliminary business, Bro. Alfred R. Barford, of the Welsbach Company, Ltd., was approved and duly exalted.

The installation of the principals and officers was carried out, the complete list being as follows:

Ex-Comp.	F. C. Tilley, P.Z.1348	M.E.Z.
"	H. W. Packham	H.
"	S. Freeman Burrows	J.
Comp.	Rae P. Normand	Scribe E.
Ex-Comp.	W. A. Surridge, P.G.Std.B., P.Z.1201, 1397, 1719	Treasurer.
"	A. C. Beal, P.Z 1719, 2913	D.C.
"	G. Hulme, P.Z.382, P.Prov.G.Std.B. Mddx.	Scribe N.
Comp.	Charles Clare	P.S.
"	W. McDowall	1st A.S.
"	James Oswald	2nd A.S.
"	W. W. Hammond	Steward
"	E. G. Bartholomew	Steward
Ex-Comp.	R. H. Goddard	Janitor

The death of Comp. W. Burgin, who at the last convocation had been elected to the office of 1st A.S., was announced, and the sympathy of the Companions was feelingly expressed.

In submitting the report of the Audit Committee, the Treasurer (Ex-Comp. Surridge) called attention to the satisfactory state of the funds. The Chapter is now fully qualified as a founding chapter of the Freemasons' Hospital.

Ex-Comp. Valon was presented with a P.Z. jewel, in recognition of his services to the Chapter; and two Brethren of the Evening Star Lodge were proposed for admission—Bro. E. J. Davison for exaltation, and Comp. Ralph Carr for joining membership.

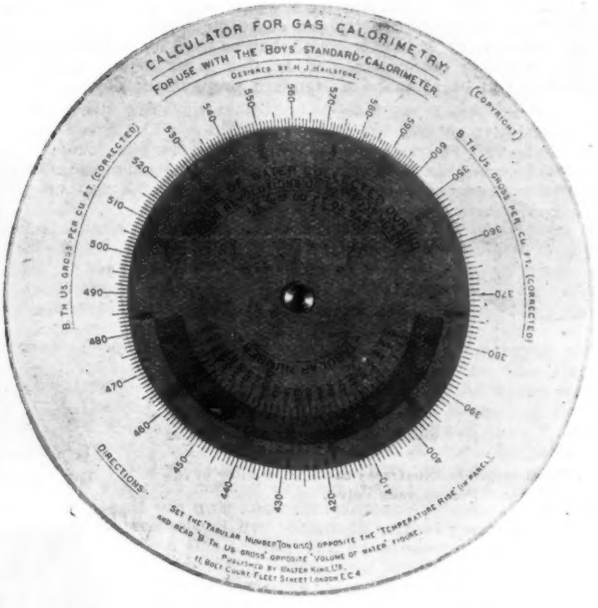
Subsequently the Companions dined together, Ex-Comp. Tilley presiding. The Loyal Toast having been honoured, that of "The Grand Chapter" was proposed from the Chair, Ex-Comps. W. A. Surridge, William Belton, and Lionel F. Dunnett responding. "The Principals," proposed by Ex-Comp. Valon, was acknowledged by them. The health of the I.P.Z. was pledged and duly responded to, and was followed by that of "The Exaltee," to which Comp. Barford replied. The toast of "The Visitors" was given by Ex-Comp. Packham, and Comps. John E. Raworth, A. H. Snoad, and E. J. Wigginton made response. At the call of Ex-Comp. Burrows, "The Past-Principals and Officers" was accepted, Ex-Comps. J. W. Broadhead and William Dommett, and Comp. Hammond acknowledging the compliment.

A Handbook for Acetylene Workers.—Messrs. Allen-Liversidge, Ltd., Victoria Station House, Westminster, S.W.1, are responsible for the publication of a "Handbook for Acetylene Workers" (price 1s. 6d.). This has been written by Mr. Leonard M. Fox, M.I.Mech.E., M.I.Mar.E., and is a book of reference and instruction for all engaged in oxy-acetylene welding operations. It sets out such data and information as may enable the welder to perform good work and to avoid the mistakes made by many beginners.

A CALCULATOR FOR GAS CALORIMETRY.

With the wide demand for regular determinations of the heating value of coal gas during manufacture and distribution, methods have become more and more standardized in every particular, and the instructions of the Gas Referees ensure that uniform conditions prevail in the tests of each undertaking. In using the Boys calorimeter under such conditions, the volume of water collected during the consumption of $\frac{1}{2}$ c.ft. of gas (uncorrected)—*i.e.*, four revolutions of a $\frac{1}{12}$ c.ft. meter—must not be less than 1600 nor more than 2400 c.c. Owing to this restriction, the range of increase in temperature of the water is also limited for the usual grades of town gas in the United Kingdom.

In working out "corrected" results from the data obtained, the three essential variables which have to be considered are (*a*) the volume of water, (*b*) its temperature increase, and (*c*) the tabular number. The capacity of the meter and the factor for converting into B.Th.U. may be combined to give a constant. For the cumbersome arithmetical calculation, quick methods should be adopted where possible; and the slide rule may be usefully employed. In order, however, to obviate the numerous settings and adjustments that are required, and to give much greater accuracy, even in the hands of untrained staff, a new and inexpensive calculator has been specially designed. With this instrument, the B.Th.U. per c.ft. (corrected) may be accurately worked out in a few seconds by one movement; extreme simplicity having been aimed at to enable a workman or office-boy correctly to manipulate the calculator.


CALCULATOR FOR GAS CALORIMETRY
FOR USE WITH THE 'BOYS' STANDARD CALORIMETER
DESIGNED BY H. J. HAILSTONE
(COPYRIGHT)
B.TH.U. GROSS PER CU. FT. (CORRECTED)
B.TH.U. GROSS PER CU. FT. (CORRECTED)
DIRECTIONS
SET THE 'TABULAR NUMBER' (ON DISC) OPPOSITE THE 'TEMPERATURE RISE' (ON PANEL)
AND READ 'B. TH. U'S. GROSS' OPPOSITE 'VOLUME OF WATER' FIGURE.
PUBLISHED BY WALKER KING LTD.
10 BOLT COURT FLEET STREET LONDON E.C.4

Calculator.

The calculator consists of a well-finished metal plate, about 7½ in. in diameter, in the centre of which is mounted a celluloid disc free to rotate. The required scales, clear and well spaced, are specially arranged so as to avoid any reversed readings, which invariably lead to confusion. The mathematical accuracy of a 60-in. slide-rule is ensured by machine setting; and in order to prevent scratching or obliteration of the figures on the celluloid, these are impressed upon the under-side. Quoting from the directions which appear on the instrument, it is only necessary to "set the 'Tabular Number' opposite the 'Temperature Rise' and read 'B.Th.U. per c.ft. (corrected)' opposite the 'Volume of Water Figure.'"

The range is sufficient to include any result obtained with the Boys calorimeter with gases of 350 to 600 B.Th.U. gross, and the instrument should prove invaluable to gas examiners and all those employed in works testing.

(The instrument has been designed by Mr. H. J. Hailstone, of the Corporation of Rochdale Gas Department. It can be obtained from the "GAS JOURNAL," No. 11, Bolt Court, Fleet Street, E.C. 4. Price 12s. 6d. post free.)

"The Door to the World Markets."—This book, published by World Markets, Ltd., of St. Mary's Chambers, Nos. 161A-166, Strand, W.C. 2, fills a need which has been experienced by every manufacturer or merchant endeavouring to develop his overseas trade. For the first time are gathered together in one volume the selected names of those journals, in each trade, locality, and language, which cover the ground overseas with the concentrated effectiveness of his own trade journals at home. The book is published as an adjunct to the personal service of World Markets, Ltd., and is amplified by valuable data concerning the British Empire, selected for their direct bearing upon the problems of overseas trade.

THOMAS GLOVER'S MULTIMETER.

Truth and quality! This was the ideal of Thomas Glover. It is now eighty years since the first dry meter became an accomplished commercial fact, and it was made by Thomas Glover. If you go to the Gas Exhibit at Wembley you will see it, tolerably inconspicuous among its companions in history, but actually the ancestor of the tens of millions made almost in its own image. There is no doubt that it is a "quality first" meter; for if you were to set it to work, you would find its registration still true.

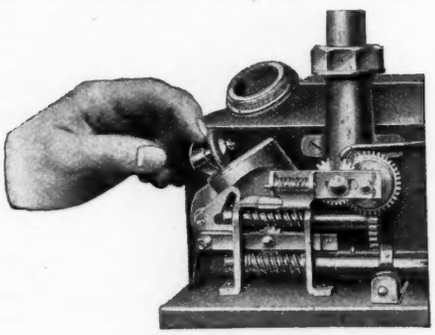
In most things of eighty years ago we now see something rather pathetic. The costumes, the ideas—though not the ideals—were so different, and appear to us rather futile and pathetic; but among those historical exhibits this dry meter looks strangely out of place. It is far too modern. Times may change, but not ideals; and the Thomas Glover ideal of truth and quality has never altered. It is not only an ideal; it is a present-day fact. The Thomas Glover meters are built round this ideal, and they are a solid accomplishment. Upwards of two million of "quality" meters in eighty years, always in the van of progress—such is the record.

Now, during the year of its eightieth birthday, the first meter sees a new period of meter history ushered in by the "Multimeter," which has been designed and made in conformity with modern ideas of manufacture and supply. The essential principle lies in the fact that the metering device proper and the prepayment mechanism are housed in separate cases. This allows of the assembling of a prepayment device to the finest limits of accuracy, and of its attachment to a meter case which, by reason of the materials used, can never conform to such close limits. With this system of construction it becomes possible to produce an ordinary dry gas-meter which may be used for ordinary quarterly account consumers, and to this same meter, whenever desired, can be attached a standard prepayment device. This can be done either on the works or *in situ*. Of course, an *in situ* conversion would probably be a very unusual occurrence; but the fact that this can be done is worth mentioning, for in certain circumstances it might be of considerable benefit—particularly to a small gas company. The system is of advantage where a company carries small stocks of new meters, and is also useful when there is need of repair to one part of the meter and not to another.

The great advantages achieved by this method of assembly, however, are immediate access to the prepayment valve, and the fact that one prepayment movement serves equally for use with pennies or shillings. By removing the prepayment cover and unscrewing a valve cap which has a gas-tight joint, the prepayment valve and chamber may be inspected, the valve lifted up, cleaned, or a new washer fitted. The value of this in the upkeep of meters cannot easily be over-estimated. The prepayment mechanism is on the Thomas Glover double-worm system, and with it are several innovations. As mentioned before, the idea is to make the same mechanism serve a dual purpose—that is, to allow the meter to function as a penny or as a shilling meter at will. It is only necessary to remove the cover and price-changer to effect conversion.

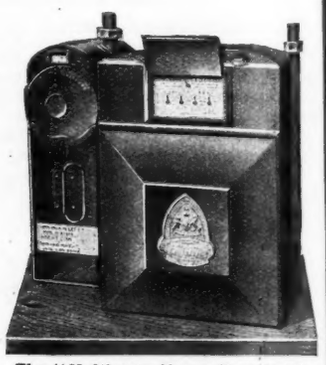
Every part is standardized; and thus any prepayment unit will fit any corresponding meter unit. All this is achieved while making the device secure from a consumer's interference; the meter is in no way less fraud-proof than the modern prepayment meter which is assembled as one; and it is unnecessary to say that there is no chance of gas leaks at any point due to the use of the unit system.

Altogether this meter maintains the tradition of truth and quality. As seen in the illustrations, it looks, and is, substantial. There should be a big future for a meter of this type, for it marks a further step in the evolution of the dry gas-meter. The makers are Messrs. Thos. Glover & Co., Ltd., of Gothic Works, Edmonton, N. 18.

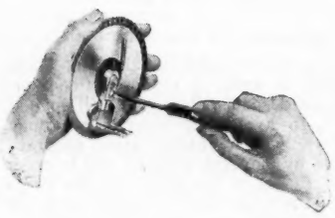


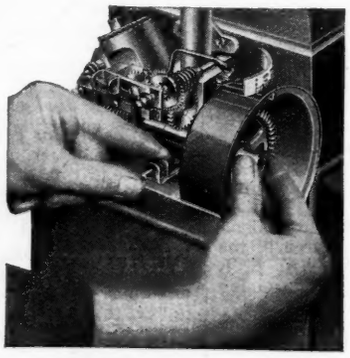
This Photograph Illustrates the Accessibility of the Prepayment Valve.

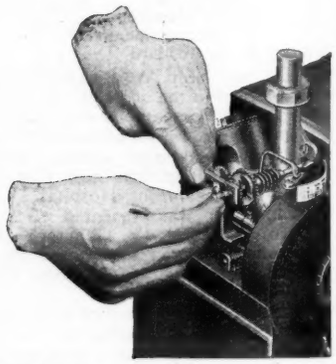
The "Multimeter" as an Ordinary Meter.



The "Multimeter" as a Prepayment Meter.







The Three Simple Operations to Convert the Meter from 1d. to 1s., or *vice versa*.

Experimental Studies on the Combustion of Carbon.

The American Chemical Society held their 67th meeting in Washington last month, and in the Section of Gas and Fuel Chemistry some "Experimental Studies on the Combustion of Carbon" were described in two papers prepared respectively by Messrs. H. F. Smith and W. C. Ebaugh and Messrs. F. G. Keenen, L. J. Prine, and W. C. Ebaugh. In order to determine the fate of carbon and the ratio of CO_2 to CO at various depths in a producer, an apparatus was constructed in which charcoal could be treated with hot gases from completely burned producer gas, or air, in regulated amounts. In the first case, reduction of CO_2 to CO was very incomplete; whereas in the second even a 3-in. layer of charcoal gave a higher ratio of CO_2 to CO than did the first, and a 6-in. layer gave a maximum yield of CO. The depth of the conventional "oxidizing zone" of a producer is therefore, it was said, probably much less than is usually imagined, and the height of fuel bed required to give a maximum CO content is surprisingly small. Again, so that the effect of oxygen upon incandescent carbon might be studied under conditions where the products of combustion could be swept away from the carbon very rapidly, thus minimizing the possibility of secondary reactions, a silica tube was provided with electric light carbons, through which a regulated current could be passed; and at points opposite the arc, side tubes permitted oxygen to be admitted and products of combustion to be removed. Results of analyses indicated that the effluent gases showed but little variation in O_2 throughout a given series of experiments, irrespective of the current employed for heating; and that they increased in CO content, and decreased in CO_2 content, with increase in current—*i.e.*, with rising temperature. The very high ratio of CO to CO_2, even though the opportunity for contact of the reacting gases with incandescent carbon was relatively small, was noteworthy, and confirmed the conclusions above referred to regarding the thickness of fuel bed required to produce gas rich in CO when air is passed through it.

THE GAS EXHIBIT.

First Official Visit and Luncheon.

Representatives of the gas industry from all parts of the kingdom last Wednesday paid their first official visit of inspection to the British Empire Gas Exhibit; and they were well pleased. One and all took the earliest opportunity to seek out Mr. F. W. Goodenough, and express to him and to the Executive Committee their congratulations on the work and organization, and keen satisfaction in the brilliant consummation of their efforts.

In the office of a technical journal which attempts to keep pace with every activity of a highly organized and very live industry, one perhaps takes as a matter of course that the contents of almost every parcel should be labelled "*de luxe*" or "*nulli secundus*," and labelled in such a way as to catch the eye; and the writer will be forgiven if he confesses—for verbiage can cloak a multitude of sins, and even photographs can be made to tell white lies—that on this, his first visit, he expected to experience some measure of disappointment in the Gas Exhibit, in detail if not in general effect. In such frame of mind he wandered up the main avenue of the Palace of Industry, marvelling at its size and the design of its roof, till a pavilion of classic design arrested his attention, and the "Spirit of Coal" beckoned him in. And inside the Gas Exhibit the wayward thought was soon dispelled, for the "general effect" was there, and "detail" was in no sense wanting. Admiration was freely expressed, and no word of adverse criticism; well, to be true, one criticism was heard—that the only ash-tray observable was beside the fire of one of the model rooms! But surely that remark was highly complimentary, for people do not usually hesitate to knock out a pipe on the floor of an exhibition.

The Chairman of the Executive Committee showed no signs of abating enthusiasm after weeks of high-pressure preparation; and when not receiving fresh arrivals he was busy "personally conducting tours," in which he was assisted by several other members of the Executive, including Mr. Samuel Tagg (President of the Institution of Gas Engineers). Among members of the General Committee all were delighted to see Mr. J. D. Smith (immediate Past-President of the Institution), who had journeyed from Belfast with well-known members of the Corporation. Several visitors were favoured with an introduction to Mrs. Mause, of Messrs. Heal & Son, who was responsible for the decoration of rooms in the "Seven Ages" tableau, and was ready to discuss that branch of art with those who wished. Our readers are aware that untiring efforts brought the Gas Exhibit to a state of completion for the opening day; and we were able to give a full account of it in a special number on April 30. A recent addition, however, has been a series of 59 large photographs of gas-consuming industrial processes. This collection (the first of several promised) has been mounted just inside the main entrance to the Exhibit, and is a valuable addition to the display. This it would also be to any local gas exhibition, and we understand the photographs will be obtainable on application to the "B.C.G.A."

A word as to the general public, whose interest and goodwill is so entrancingly sought. Though two Kings and two Queens were present in the Exhibition, though the sun was shining—*mirabile dictu*—with a strength that made even a raincoat look fastidious in spite of weeks of gloom, and though innumerable restaurants and cafés suggested a timely lunch, the public continued to pass through, to pause, and to voice that interest and goodwill. Inquiries are many, from this country and abroad. We are informed that fifty were received on the opening day. Firms who advertise in the Press or on posters all over the country do not expect immediate sales as the major result of their enterprise; it is inquiries they seek, from which business may result. Inquiries result from interest aroused. In the case of the Gas Exhibit, there have been sales effected as a result; there have been many inquiries; and the interest taken by the public is manifest. As evidencing the latter point, it may be stated that in an important industrial city of the Midlands the Gas Engineer has, without soliciting the opinions, received favourable comments on the Gas Exhibit from six influential men in his district. The "co operation of brothers" is bearing excellent fruit.

THE LUNCHEON.

The Great Stadium Restaurant was reserved for the luncheon, and the visitors dispersed from the Exhibit soon after 1 p.m., and made their way to the broad terrace which flanks the Stadium entrance. Wandering through the grounds, or pausing on one of the lake bridges, the newcomer is offered a pleasant surprise at every turn; and above all he is impressed with the scale on which the whole thing has been done. But the Stadium seems to dominate palace and kiosk alike, and its towers remind one of the keep of some impregnable castle. This idea is enhanced as one mounts to the terrace, for the whole layout of the Exhibition is at one's feet, and the terrace seems to look straight into the bunkers of the golf course on a hill two miles away.

The Great Stadium Restaurant opens on to this terrace, and has windows throughout its length. Massive square pillars carry the roof, and royal red is the dominant tone in its decoration. Half this hall sufficed for the large company present, which included some 200 members of the gas industry and about 120 representatives of the London and provincial Press. The Chairman of the Gas Exhibit General Committee (Mr. D. Milne Watson, M.A., LL.B., D.L., Governor of the Gas Light and Coke Company) was unavoidably prevented by important business from being present earlier in the morning; but a hearty greeting awaited him when he took the Chair at the luncheon. To the right of the Chairman were Mr. H. E. Jones, Mr. H. E. Bloor, Mr. F. W. Goodenough, and the immediate Past-President of the Institution of Gas Engineers; and to the left were Sir Arthur Duckham, K.C.B., Mr. Samuel Tagg (President of the Institution), Mr. F. C. Tilley (Chairman of Council, Society of British Gas Industries), and Mrs. Cloudesley Brereton.

After luncheon, "The King" was honoured, and then attention was turned to the toast of the day.

SUCCESS TO THE GAS EXHIBIT.

Sir ARTHUR DUCKHAM: Ladies and Gentlemen, I have a task which is both a pleasure and an honour to me, inasmuch as it is the first occasion on which the gas industry has formally met at the British Empire Exhibition. Not only is the task a pleasure and an honour, but it is not a difficult one, because I have really only to pave the way for Mr. Milne Watson, who rightly stands at the head of the gas industry. My toast is: "Success to the Gas Exhibit." Many of you have seen the exhibit in the earlier stages, but this is the first time I have had the opportunity. The gas industry must be very—and properly—proud of its exhibit; and it must be proud of those who have given so much labour to the production of a very fine show. I will not criticize; but I had a feeling in going round the exhibit that it does not quite give the right idea of the magnitude of the gas industry, and of the services it renders to this country. ["Hear, hear."] The exhibit shows clearly how gas is the servant of the household; how the troubles of the housewife are done away with. Space, however, did not allow of a sufficient exposition of what gas stands for in the industrial life of the country. We must look to propaganda—to publicity, and word of mouth—to let the country understand what gas means in the economy and life of its inhabitants. I feel that very fine publicity work has been done in connection with the exhibit. I have been abroad recently; and in Paris I took up a paper, and in it I saw a splendidly displayed article on the Gas Exhibit. The information was produced clearly and properly. We of the gas industry all realize and appreciate what Press notices and advertisement have done for the Gas Exhibit. One of the newspapers I read—and I do so because the news in it is of the shortest character, and it is usually fairly accurate [laughter]—is the "Financial Times." Looking through that paper this morning, I found an advertisement dealing with the Gas Exhibit at Wembley. Some of you may think it is the wrong sort of advertisement to appear in the "Financial Times." I do not. It told me that the gas industry is large, and that it makes the utmost possible advantageous use of coal, by producing from it many valuable products. There are quite a number of people who read nothing else but the "Financial Times;" and those people will now know that this exhibit marks an era—the era of the Smokeless City. People in authority and in high places have spoken on this subject, and have taken an interest in it—latterly more than ever. I notice that the Lord Mayor yesterday was complaining of the smoky condition of London. He said that the Mansion House is a very nice place to live in, except that his wife complains of the smuts on the windows. The Lord Mayor recognizes that otherwise the City is a good place in which to live. There need be no smoke in the City; but it is only by talking, writing, and advertising—in other words, by educating the people—that you will get rid of the smoke in the City to day. I would like to say there is one class of men in this country for whom I am sorry. They are the coal merchants. I think between Mr. Shinwell and the gas industry, the coal merchant is doomed. What the coal merchant must do is to go out of the coal business, and become a coke merchant. ["Hear, hear."] I am certain many thousands who will walk through your exhibit will appreciate the possibilities of gas—the artistry and utility of gas in the home, and will begin to realize what gas means to the country. Though there are hundreds here interested in gas, I should not like to say that more than a few realize what gas really means to-day. If we gas men do not appreciate it fully, how can the general public understand it? It is only by such a gas exhibit as we have here that we can show what gas means to the country. Recently I came back from America, in which country you are visited by representatives of the newspapers. A Press friend of mine met me, who had met me before. He asked me what I had to say about America. I said two facts had struck me—that its cities were dirtier, and its business men were getting slower. It is a fact that in America their cities are getting dirty, because they are using soft coal; and there is a very strong feeling there that this increased dirtiness can only be countered by the use of gas. The people in America pay $1.40 and $1.50 per 1000 c.ft. for gas for heating their houses; and they find, although the winters are long, that it pays. I am certain you all wish the Gas Exhibit every success; and I am sure you will all heartily welcome Mr. Milne Watson when he replies to the toast—"Success to the Gas Exhibit."

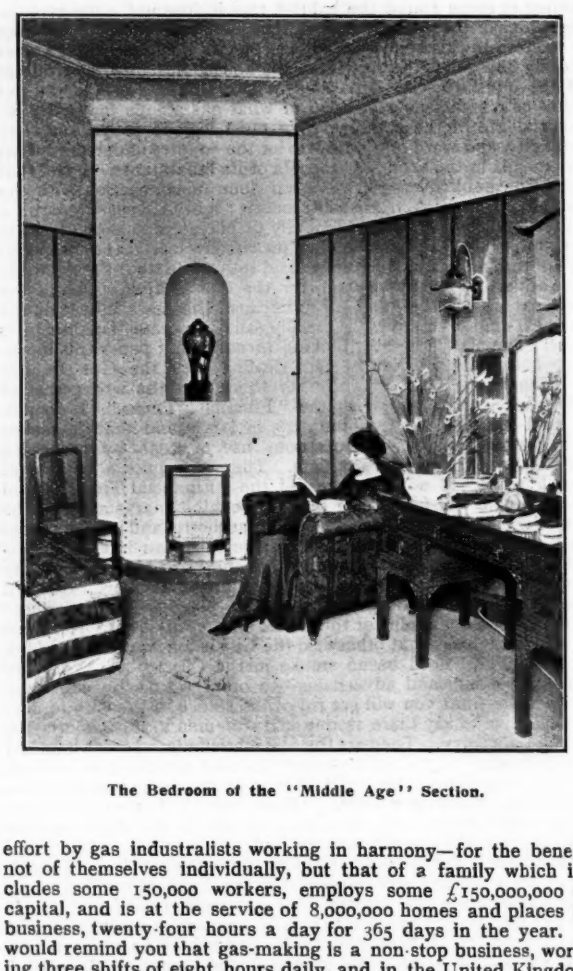
The toast was enthusiastically received.

REPLY BY THE CHAIRMAN.

Mr. D. MILNE WATSON, the Chairman of the Gas Exhibit

General Committee, was enthusiastically received on rising to respond to the toast. He said: Sir Arthur Duckham and gentlemen, I rise with great pleasure to reply to the toast which has been so eloquently proposed. I would, in the first place, like to say a personal word. I am sorry that an important business appointment prevented me from being present this morning to visit with you the Gas Exhibit; but needless to say I have seen it frequently already. It is a great pleasure to me to be connected with the exhibit, and to see so many of our representatives of the gas industry, and so many of our friends of the Press, here to inspect the exhibit. Of course, it is quite possible, Sir Arthur, that the exhibit is not so large and important as the industry itself; but had we to take a building extensive enough to hold a display which would be really representative of the industry and its many activities—why, I do not suppose we should find one which would fully contain it. The exhibit, I am sure, will convince many people that gas is very much alive to-day, and that there is a very great future before it.

It is not an exhibit which is being run by a section of the gas industry, but by all its sections and the allied industries. It is a pleasure to me to know that it is being financed by undertakings representing upwards of 90 p.ct. of the make of gas in these islands, as well as by many others not only in the British Dominions, but on the Continent of Europe, together with the manufacturers of gas plant and appliances. Thus, in every sense of the word, it is a co-operative display. As His Majesty the King said of the exhibition as a whole, the Gas Exhibit is a co-operative effort by brothers working in harmony—that is, a co-operative



The Bedroom of the "Middle Age" Section.

effort by gas industralists working in harmony—for the benefit not of themselves individually, but that of a family which includes some 150,000 workers, employs some £150,000,000 of capital, and is at the service of 8,000,000 homes and places of business, twenty-four hours a day for 365 days in the year. I would remind you that gas-making is a non-stop business, working three shifts of eight hours daily, and in the United Kingdom uses a ton of coal every two seconds, as well as a considerable quantity of gas-making oil. The gas made in a year (270,000 million c.ft.) would fill a gasholder 3500 ft. in diameter as high as Mount Everest, or fill a 10-in. pipe reaching from the earth to the sun, some 93 million miles. I think that gives you a very good idea of what an enormous quantity of gas is consumed in this country to-day. This industry, already very large, as the figures I have given you suggest, is constantly growing, and was never in a more healthy and progressive state than at the present time. So far from aggravating in any way the serious problem of unemployment, the industry is glad to be able to say that though the hardest part of the work has been lightened by the improvement and modification of processes, it employs to-day more workers than ever, and sees every prospect of steady expansion.

The British Empire Gas Exhibit has been planned to show, by a few of many possible examples, how gas—very soundly called "the purified spirit of coal"—affords service to the Empire in its homes, its industries, and its cities. In the Empire's homes, as is illustrated in the living tableaux in the exhibit, gas serves through all "The Seven Ages of Woman" (and Her Man) to diminish dirt and drudgery, and increase leisure and comfort. Gas has been variously designated "mother's silent servant," "nurse's third hand," and "granny's faithful friend." The truth of this is demonstrated in the model rooms for the "Seven Ages," which contain in operation the most artistic, efficient, and hygienic gas appliances and fittings. These also provide a convincing demonstration that modern methods of lighting and heating can be made to harmonize with any scheme of decoration and furnishing, modern or "period," costly or inexpensive. Gas spells true economy in the home, for it enables woman to make the best use of every hour, and get the best value out of every pound.

In the Empire's industries, gas serves a thousand-and-one purposes, as a source of light, heat, and power, ensuring improved and increased output, and better working condition for employees; while the bye-products of its manufacture provide the most economical smokeless solid fuel for constant heating (coke) and the basic raw materials of many important industries, especially agriculture, and the drug, dye, explosives, and motor spirit trades. It is literally true to say that there is little if anything that a man wears, or eats, or reads, or uses, but what gas or some other product of the gas-works has played a part in its making. I may give a few illustrations. His felt hat has been shaped by the heat of the gas, his walking-stick curved by it, his collar and shirt ironed by it. His cravat has been coloured by coal-tar dyes; the cloth he wears was "conditioned" by gas. His meals are probably cooked by it—they certainly are if he is at Wembley; the biscuits he eats were baked by it—as in the fine biscuit exhibit in the Palace of Industry; the sweets or chocolates he buys have been made from sugar boiled by gas, and they have been baked by it; his coffee has been roasted by gas; and the type used for printing the paper he reads over his coffee was melted by its steady, easily controlled, reliable heat. The engine for his motor car was "run-in" by gas on the testing-bench; the aluminium for the castings used in it (as in aeroplane and submarine engines) was melted in gas-furnaces such as are shown in operation in the exhibit; the gears were hardened by gas, and the sheet metal work japanned and enamelled by it. And so on, through every article of his daily use, man owes to gas some degree or other of its production and perfection.

"If it's heat you want, it's gas you want," is true in nine cases out of ten in industry; and in the tenth case it is coke, so there is never a need (as Sir Arthur Duckham has said) to produce that curse of our civilization—that destroyer of daylight and dealer of disease and death—the "hellish cloud of sea-coal smoke," which Evelyn so heartily and justly damned in his famous Diary of long ago, and we continue so thoughtlessly to produce to-day. Gas, in short, is the greatest smoke preventer in the world. It is by furnishing the means for dispelling that blight upon the bodies and the spirits of their inhabitants that gas offers service to the towns and cities of the Empire; for it has been truly said that everyone who uses a gas-cooker, a gas-fire, a gas bath-heater, or a gas-furnace helps to bring down the death-rate and restore beauty and joyousness to urban life. The demonstration at the Gas Exhibit of how the right way of using coal—"the gas way"—leads to conservation of light, life, and wealth; while the wrong way—"the crude way"—leads to waste, destruction, and death, will, it is hoped, help to impress those truths on the apathetic mind of the community. And when the visitor has grasped a few of the many truths the Gas Exhibit has been designed to demonstrate, he or she will be satisfied that it is a great industry which offers its services, and that we have in a worthy way demonstrated in the gas exhibit what are our main objects. If then our visitor feels need to pause for the digestion of these truths, the Rest Lounge, which forms half of the exhibit, with its comfortable chairs, tables, and telephones, provides the opportunity and the means. In Scotland, travellers say "God bless the Duke of Argyll" when they rub their shoulders against the granite posts he provided. Maybe at Wembley they will learn to say "God bless the Gas Exhibit," when they have rested awhile in its easy chairs and realized that "Service First" is the motto of the industry.

Thanks to the Chairman.

Mr. H. E. Jones asked those present to convey their obligations to their Chairman, not only for his conduct in the chair that day, but for his conduct of the affairs of the gas industry, which were of a very heterogeneous order. He referred to the great difference there was in the applications of gas to-day compared with the time when he started on his professional career, and also to the advantage which in the use of coal the gas industry possesses over electricity compared with the employment of coal for steam-raising purposes. He also spoke of the gratification of the gas industry that Mr. Milne Watson had allowed himself to be the head of the Gas Exhibit. The cordial way in which he devoted his great abilities to the interests of the gas industry was the admiration of them all. He asked them to drink to the health of their Chairman—the leader of the gas industry.

Mr. Milne Watson thanked Mr. Jones for his kind words and all present for the way in which they had drunk his health. It was no ordinary pleasure to him to be associated with them in this great movement, and it was also a matter of much satisfaction to him that his work was so handsomely recognized by the Grand Old Man of the gas industry who had proposed his health. [Cheers.] He was proud to have him sitting by his side; and

THE RESTAURANT KITCHEN IN THE DOMESTIC SCIENCE SECTION OF "THE SEVEN AGES OF WOMAN."

the best thing they could all hope for themselves was that when they reached the age of Mr. Jones they would be as energetic as he was. [Applause.]

In the afternoon, the representatives of the industry had a private conference, convened by the National Gas Council.

BRITISH EMPIRE EXHIBITION NOTES.

The Activities of the Fuel Research Board.

In the "JOURNAL" for April 30 (Exhibition Number) a short account was given of the display of the Fuel Research Board, who have their exhibit in the British Government Pavilion. The comprehensive demonstration of the Board's activities enables the visitor to form an impression of their valuable work.

THE ASSAY OF COAL FOR CARBONIZATION PURPOSES.

One of the most interesting exhibits is the one showing the apparatus designed by the Board for determining the value of a fuel for carbonization purposes. The working details of the method, which employs 20 grammes of coal, and takes 2 hours to carry out, are shown in front of the apparatus. The results obtained have been carefully studied and correlated with other results obtained on a works scale, so as to obtain factors of comparison. These factors, after continued proof, have shown that the method is reliable, and may be used to forecast the probable behaviour of any coal, before large-scale operations are undertaken. In the experimental work on low-temperature carbonization, when the effect of suitable blending is so marked, the apparatus is again useful, for the blending proportions can be determined by its use, and applied directly to large-scale work. The coke specimens obtained by suitable blending are illustrated in a collection of samples prepared from coals of different caking properties. From these it is seen that Walton Main coal gives by itself a hard dense coke. Coal from the Mitchell Main seam (South Yorkshire) gives a swollen and porous coke; and the result of carbonizing Ellistown Main coal is a non-coherent and powdery residue. By admixture of the last two, a hard and compact coal is obtained.

It may be of interest briefly to describe the method of procedure. The coal sample is ground to pass a 60-mesh sieve, and is dried at 105° C. The gasholder is charged with liquid, and the suspended reservoir adjusted so that its water level is 1 c.c. below this. The retort tube and condenser are weighed, and the former is charged with 20 grammes of coal spread out in a layer occupying two-thirds of the diameter of the tube. The apparatus is then connected up, and the furnace, which is shorter than the retort tube, is heated to 300° C. When this temperature is attained, the furnace is run along the retort until it is within 1 in. of the side tube of the retort, in which position the centre of the coal charge coincides with the centre of the furnace. When the evolution of air and occluded gases ceases, the temperature is raised uniformly to 600° C. over a period of 1 hour. During this period, the temperatures at which water vapour and oil vapour appear are carefully observed. The counterpoise arrangement of the gasholder maintains the pressure in the system at a level gauge, and the rate at which it draws water from the holder is a measure of the gas evolution. This is determined at regular intervals by withdrawing the delivery tube and measuring the flow of water for 1 minute. Heating at the final temperature is continued for 1 hour, at the end of which time the rate of evolution of gas has fallen to a low figure. The furnace is then withdrawn, and the retort allowed to cool.

DR. LESSING'S ASSAY APPARATUS.

The high-temperature assay apparatus designed by Dr. R. Lessing is exhibited adjacent to the one employed by the Fuel Research Board. Dr. Lessing's apparatus consists of an electrically-heated furnace, a silica retort, a thermocouple, a scrubber-condenser, and a eudiometer tube to act as a gasholder. By this method, the sample of coal is ground to pass through a 30-mesh sieve, the grinding being done so as to minimize the formation of "fines." One gramme of the air-dried sample is placed in the retort tube, and a piston is gently inserted; care being taken that the escaping gas does not carry with it any coal dust which might get jammed between the piston and the retort wall. The scrubber-condenser is filled with cotton-wool, kieselguhr, or some other absorbent material. As soon as the temperature of the furnace is constant, the retort is inserted, and the progress of gasification followed with the aid of a stop-watch; the volumes of gas at intervals of 30 secs. being noted. Tests at 900° C. are completed after 7 minutes, and those at 600° C. after 15 minutes. After cooling, the coke cylinder and the carbon from the retort walls are turned out of the tube and weighed separately. The bulk of the tar condenses in the scrubber; and by filtering the solution through a dry filter it is almost completely freed from liquor. The filter is washed with a solvent, and the residue from evaporating the filtrate and washings is weighed. This gives a fair and comparative measurement of the tar yield. By the side of the apparatus, the results of a typical test are shown, together with the correlation to gas-works yields.

An illustration of the additional information obtainable, in the examination of coals which give similar data on proximate and ultimate analysis, is presented in the results of examination of a seam in eight sections. The cokes obtained by the Fuel Research Station assay method and by that of Dr. Lessing are shown in comparison with the buttons obtained in the determination of volatile matter. The object of this exhibit is to show the differences in the coking properties of the coal at different parts of the same seam; these differences not being detectable by chemical analysis. The coal tested was taken from the Arley Seam of the Atherton Colliery, Lancashire. The seam, which is 4 ft. thick, was divided into eight sections, each 6 in. deep; No. 1 being the top section and No. 8 the bottom of the seam. Sections Nos. 4 and 8 are distinctly different from the others, both giving a hard

dense coke with no tendency towards the swelling which is exhibited by the remaining sections.

There is also a collection of coke samples prepared from the principal seams of the Lancashire coalfield by the low-temperature method of the Board and the high-temperature process of Dr. Lessing. Samples of ash demonstrate the difference in colour and quantity from different seams in the same coalfield.

A Thermo-Electric Surface Thermometer.

Of considerable interest is the exhibit of a thermo electric surface thermometer. This consists of a fine thermocouple, whose junction, with a short length of wire on each side (equal to 25 diameters), is embedded in a groove in a small copper disc, from which it is electrically insulated by a thin coat of heat-resisting varnish. The disc is mounted on asbestos and cork, or other good thermal insulators, and is pressed against the hot object by means of a spring. Radiation of heat is checked by means of a polished nickel bell surrounded by a disc. The time of contact necessary for an accurate reading is about 7 minutes, if the couple is cold at the commencement. The apparatus can be used satisfactorily up to about 300° C.

Another piece of apparatus shown is for the measurement of specific gravities of gases in small quantities. The principle employed is the measurement of the difference in weight of two equal columns of gas and air of known length. A Chattock testing gauge measures the differential pressure of the two columns under known conditions of temperature and pressure. Both air and gas can be used either dry or saturated, and the temperature of the columns can be maintained at any value between atmospheric and 100° C. by means of a water-jacket heater. The mean temperature of the columns is measured by an air thermometer the bulb of which runs throughout the whole length of the column.

Peat.

Mention was recently made in the "Journal" (Aug. 8, 1923) of the report of the Fuel Research Board for the years 1922-23 dealing with the production of air-dried peat. Peat, as it occurs in an undrained Irish bog, contains from 92 to 95 p.ct. of moisture; and by draining the bog, the moisture can be reduced to between 88 and 91 p.ct. Peat cannot be usefully employed as a fuel until the moisture content is reduced to 25 to 30 p.ct.; and in every case where peat is used commercially at the present time, it has been air-dried. Attempts have been made in almost every country in which peat exists to drive off the moisture by the application of heat; but there is no process based on this method which is to-day working on a commercial basis. The enormous water content is well illustrated in the section of the Fuel Research Board's exhibit devoted to peat. In a large bottle is a 20-lb. sample of a raw macerated peat, containing 90 p.ct. of water, as taken from the bog. In an adjacent bottle the water content of this mass is shown; and near-by are three specimens of air-dried peat, containing 20 p.ct. of water, produced from 20 lbs. of the macerated peat. A specimen of non-macerated peat from the Tullymore Bog demonstrates its open character. Samples of peat moss litter, the marsh type, and sphagnum peat are also shown in this section, together with the cokes produced by carbonization in vertical retorts, and the yields of tar obtained by this process.

Radiation from Retort Settings.

Another exhibit deals with temperature control and the prevention of heat losses in retort installations. It is demonstrated that hot surfaces should have as little iron work about them as possible. The remarkable results due to the replacement of iron sight-boxes by fireclay ones are well worthy of record here. Tests were made on the radiation losses from a setting of Glover-West vertical retorts at H.M. Fuel Research Station at East Greenwich. The total number of sight-boxes is 36 on the gas-inlet side and 40 on the observation side. It was found that the mean temperature of the iron boxes was 290° C., and that of the fireclay boxes 170° C. With three differing mean combustion-chamber temperatures, the alteration caused by the substitution of fireclay was determined by a practical test. The following is a comparison of the therms per hour lost by radiation.

Mean Temperature of Combustion Chamber.	Loss, Therms per Hour.	
	Iron Boxes.	Fireclay Boxes.
1260° C.	8·37	6·56
1180° C.	7·25	5·56
1080° C.	6·17	4·72

Other Exhibits of Interest.

Tar films have been prepared to show the difference between the tars produced by different processes. A primary coal tar in which little cracking has taken place shows clear yellow. Where the cracking is excessive, as in modern gas manufacture, the tar is black and dense. The assay tar appears yellow, the horizontal tar made at 600° C. is brown, while the gas tars are almost opaque. The fuel oil prepared by the Lessing process from low-temperature horizontal-retort tar is shown in two films, one before and the other after extraction of the tar acids. These films are as clear as that of the assay tar.

Another section of the exhibit demonstrates the manufacture of solid smokeless fuel from blended bituminous coals. A sample is shown of the coke obtained by the carbonization of a mixture of 60 p.ct. Mitchell Main coal and 40 p.ct. of Ellistown Main. The coke is hard and dense, though neither coal produces a suitable coke if used alone. There are specimens of coke from horizontal and continuous vertical retorts, and of briquettes prepared from Dalton Main coal by low-temperature carbonization in horizontal steel retorts.

There is a demonstration of the method employed by the Fuel Research Board of taking a representative sample of a seam of coal. A 4-in. square block is cut vertically down the entire face of the coal seam, and therefore contains all the bands of the

SWEET-MAKING BY GAS APPLIANCES—BY MR. JOHN LEWER, CONFECTIONER OF OLD STREET.

GAS STANDARDS IN THE AMUSEMENTS PARK AT THE BRITISH EMPIRE EXHIBITION.

The photograph was taken looking from the Great Racer towards the Giant Switchback. Note the Four-Lamp Standard in Foreground.

seam in the proportions in which they occur. The seam is then available for examination in the laboratory, either as a whole or in sections. One showcase is devoted to a demonstration of the natural history of coal, and another is set apart to display the results of the microscopical investigation of iron pyrites in coal. As a result of this work, nine individual forms of pyrites have been identified.

In addition to the various showcases, the walls are covered with tables giving some of the results of the Board's work at East Greenwich. These tables are indicative of the wide range of subjects studied, and the vast amount of useful work accomplished. Such subjects as gas-making in vertical retorts, charcoal as a producer fuel, the utilization of seaweed, investigations into the heating of rooms by different domestic fuels—to mention only a few—are dealt with in detail; and a series of photographs of the Research Station completes an exhibit of great interest, not only to those immediately interested in the work of the Board, but to the public generally.

Preventing Boiler Scale.

On the stand of Palmer's Shipbuilding and Iron Company, Ltd., of Jarrow and Hebburn-on-Tyne, there is shown an apparatus by Filtrators, Ltd., of Cory Buildings, Fenchurch Street, London, for the prevention of boiler scale. There is a cast-iron cylinder, within which a perforated cylinder is placed which is filled with ordinary linseed and a small amount of common soda. Some steam from the boiler is allowed to pass into the filtrator and there condense, extracting from the linseed the mucilage, which forms with it a sort of emulsion. This is allowed to pass continuously into the boiler through pipes leaving the base of the apparatus and passing into the water space, between the combustion chambers of the boiler. When the solids contained in the water are precipitated, the minute particles produced are acted on by the mucilage of the linseed, which prevents their adherence to each other or to the surfaces of the boiler. Many boilers have been satisfactorily worked on this principle. While harmless to the metal of the boiler, the mucilage will remove an old deposit. It is said that the substance which is removed from the linseed is only that which is soluble in water, and consequently no oil is introduced into the boiler.

F. W. Berk & Co., Ltd.

By any readers visiting the Exhibition, a copy of the "Business World" may be had upon application at the stand of Messrs. F. W. Berk & Co., Ltd. (No. A44), in the Chemical Section of the Palace of Industry. The booklet contains brief particulars (with numerous aerial photographs) of ports and trade centres of the Empire, along with an article depicting the activities of the firm named. Messrs. Berk & Co. are acid and chemical manufacturers and merchants, with offices at No. 1, Fenchurch Avenue, London, E.C., and factories at the Abbey Mills Chemical Works, Stratford, London, E., and the Pentrepoth Chemical Works, Morriston, near Swansea. The business is more than half-a-century old, and the works are fully equipped on modern lines for carrying out all the processes of acid and chemical manufacture by the most advanced scientific methods.

Where the "Journal" can be Consulted.

Readers are reminded that, at the "Trade and Technical Journals Bureau" the current and the two immediately preceding issues of the "Journal" may be seen and read. The stand is No. 277, S.E.Block, Bay 24, in the Palace of Engineering. It may be easily reached by entering the Palace through the Bessemer Gate.

Engineering Conferences.

The Society of Engineers are convening two conferences of the members of the associated Institutions and their friends (including ladies) which are to be held on Friday, June 6, and Monday Sept. 15. They will be from 10.30 a.m. to 1 p.m.; and after lunch at 1.30 p.m. the members will be free to inspect the Exhibition according to their individual tastes. They will assemble for tea and social intercourse at 5 p.m. This will end the official programme; but if a sufficient number should apply for tickets, provision will be made for the members to have a light dinner together, so as to afford a further opportunity for representatives of the various Societies to become known to one another. During the mornings, short papers on engineering subjects will be read.

The cost of the tickets has purposely been kept very low, to encourage young engineers to benefit by the arrangements. The price of the tickets is 5s. 6d. each person for each day. This sum includes (1) admission to the Exhibition grounds and the conference, (2) lunch, (3) tea. The additional price for dinner is 3s. 6d. Members of other Societies will be supplied with tickets at the above prices so far as accommodation will permit. Application should be made at once to the Secretary of the Society of Engineers, No. 17, Victoria Street, Westminster, S.W. 1.

Effect of Indene on Naphthalene Determinations by Picric Acid.

In a paper submitted to the Gas and Fuel Section of the American Chemical Society, Messrs. Ralph L. Brown and Henry G. Berger show that indene and cumarone, when entrained in a gas and passed through an aqueous picric acid solution, form insoluble picrates. Evidence is presented indicating definitely the presence of indene and cumarone in coal gas, and indene in carburetted water gas. The conclusion is drawn that the picrate method for the determination of naphthalene in gas is much in error, unless the indene picrate present be determined and a correction applied. Picrates obtained from coal gas and carburetted water gas in sixteen instances have been found to be mixtures of from 50 to 75 p.ct. of naphthalene picrates and 25 to 50 p.ct. of indene picrate. The presence of indene picrate in naphthalene picrates obtained from these industrial gases is a logical explanation for many determinations of naphthalene which give results higher than theory permits. The significance of the true character of the precipitates obtained in naphthalene determinations in the gas industry is pointed out both in the sale and distribution of manufactured gas and also as a guide to operation of carburetting units in water-gas plants.

RETORTING AND REFRACTORY MATERIALS.

By Vernon E. Harston, of Norwich.

[A Paper read before the Eastern Counties Gas Managers' Association, May 7.]

I much appreciate the honour of an invitation by the President of the Association to prepare a paper for this meeting; and, in so far as this contribution falls short of the high standard set by members, I must claim your indulgence on the ground of inexperience in the matter of preparing and reading papers. I need not enlarge upon the difficulty in the selection of a suitable subject, as it must be the common experience of the majority; but it has been suggested that something on retort settings and refractory materials would be acceptable, and likely to encourage a useful discussion.

It will be agreed that dividends continue, as heretofore, to be made in the retort-house. This being so, the retorts and their settings remain the heart of our business; and we cannot be too diligent in their constant study and improvement. It has been said that until the introduction of the modern vertical retort strikingly little change had occurred during the best part of 100 years in the process of distilling coal in gas-works. From casual observation this would appear to be half a truth; but if the retort setting be viewed as a machine for re-distributing the potential thermal energy of the coal among the products gas, tar, and coke, with a minimum of thermal loss and to the greatest commercial advantage, the great advance in the efficiency of this machine cannot be denied, the over-all thermal efficiency having been raised from something under 60 p.ct. to rather over 80 p.ct. The conservation of the therm is now the order of the day, but in this connection the thermal efficiency must not be allowed to blind us to the commercial efficiency of the process and the difference in the selling price of the therm in the form of gas, tar, and coke. The therm in the form of gas is marketable at about six times the price realized for the therm as coke, and about four times that of tar.

The earlier retorts were of iron, and it was in the year 1820 that a patent was first taken out by a Mr. Grafton for the construction of retorts in fireclay; the first fireclay retorts being erected at Wolverhampton, in the factory of Messrs. Butcher. These retorts were of rectangular section, but were soon altered to the Ω section. (Fig. 1.)

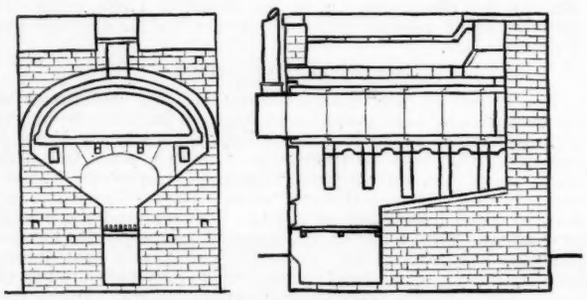


Fig. 1.—Grafton's Fireclay Retort, 1820.

Fireclay retorts by Grafton were in use at the Cambridge Gas-Works in 1839, and an account is given in Clegg's "Treatise" of experiments made by Grafton at Cambridge to ascertain the cause of the deposition of carbon on the retort interior. As can be imagined, there was much early prejudice against the fireclay retort, its conductivity being only one-tenth that of the iron retort; and this, coupled with the porous nature of the fireclay, gave good ground for criticism.

The early fireclay retorts suffered much from cracking, and Mr. Thomas Spinney, of Cheltenham Gas-Works, appears to have been the first to introduce an admixture of grog (in the form of sharp river sand and pipeclay) in a successful attempt to improve the quality of the material. Mr. J. Clift, of Birmingham, followed Grafton and Spinney in 1842, in constructing retorts built entirely of firebricks, and seems to have made use of a system of segmented retort construction extraordinarily similar to that in use to-day. (Fig. 2.)

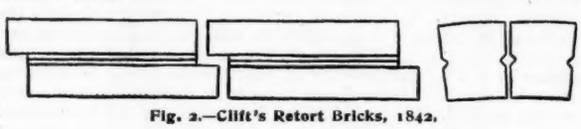


Fig. 2.—Clift's Retort Bricks, 1842.

His arguments for this construction were precisely those more recently put forward when contrasting the moulded with the segmented retort.

A perusal of these historical matters is one of much interest in the light of the development which has taken place during the past century. Combustion has been brought to a fine art, and the ever-increasing temperatures at which carbonization is practised have called for constant improvement in the design of retort settings and in the material from which they are constructed. The study of refractories has, in recent years, become a special branch of scientific investigation, and continues to receive the close and continuous attention of able workers. The gas engineer is more particularly concerned with the practical use of refractory materials in retort benches, water-gas plants, &c., with the careful and economical selection of the most suitable materials, and with the methods of application which will result in the greatest commercial efficiency. The great advance in this connection has more recently been due to the efforts of the Refractory Materials Committee of the Institution of Gas Engineers, and the manufacturers of refractories working in conjunction with them; much valuable information being thereby conveyed to the gas industry for practical application in retort settings. By reason of the comparatively long life of retort settings, the building-up of experience on the working scale is, of necessity, a somewhat protracted business. Starting with a given setting, it is important, however, that such methodical observation and records be kept as will enable improvements, as experience dictates, to be effected, so that by the process of trial and error as perfect a setting as possible is evolved.

As applied to fire goods used in gas-works, the term "refractory" is relative, as denoting such materials as will resist without fusion the temperature to which they are to be subjected. The decomposition of particular rocks by weathering over long decades has given us our deposits of fireclay, the varying degree of such weathering accounting for the different qualities of the clays found. The true clay substance, AL_2O_3, $2SiO_2$, $2H_2O$ (kaolin), obtained from the feldspars by the action of carbonic acid and water, is the final product, but is found only in small quantity. As the clays more nearly approach this composition, they are the more infusible and, therefore, desirable. Fireclays, as mined, contain impurities in the form of oxides of calcium, sodium, potassium, iron, and magnesium, in varying quantities. The removal, as far as possible, of such impurities, by the action of CO_2 and water, which has obtained, more or less, during the natural formation of the clay, is continued artificially in the process known as "weathering" at the fireclay works. Such impurities, if retained in the material, tend to the formation of fusible silicates; and it is found that the permissible quantity of the impurities in silica material is much lower than in the case of aluminous clays.

Chemical analysis is helpful in determining the nature of a fireclay, and for comparing with material of known qualities; but it is not to be relied upon in itself as a safe guide as to refractory properties. An appreciable iron content, for example, would probably be objectionable only if accompanied by sufficient alkalis to set-up fusion. An exception is the case of material in a reducing atmosphere—as in producer or water-gas plant, where the iron content existing in the material in the ferric state is reduced to a ferrous oxide. The latter oxide readily fluxes with silica, forming ferrous silicate. In an oxidizing atmosphere, such as exists for most part in retort settings, the iron oxide remains in the ferric state, and such action does not occur. The important matter of shrinkage on burning is one which is carefully looked after by the manufacturer, by the addition of varying percentages of grog ranging from 20 p.ct. to 40 p.ct., according to the nature of the green clay and the density or porosity required. While a few materials to be obtained show no tendency to shrink or expand in use, it is generally observed that silica material tends to expand, and aluminous clays tend to contract. It follows that the higher the type of setting, the greater the necessity for counteracting these variables by the careful disposition of the two classes of material to neutralize such movements.

The expansion of siliceous materials is explained by the fact that the oxide of silicon in the brick or block exists in three allotropic modifications of silica—quartz, tridymite, and cristobalite. As moulded prior to burning, the bulk of the silica is in the form of quartz. At about 870° C. the quartz is converted into tridymite, the material expanding with a fall in specific gravity from 2·65 to 2·30, and at about 1470° C. the tridymite is converted to cristobalite, with further expansion. These changes are not reversible. The degree to which these conversions take place during the manufacture depends on the protraction and temperature of the burning; and the proportion of the respective forms of silica will necessarily vary. Upon subsequent protracted exposure to high temperatures in the settings, some further conversion takes place, with consequent expansion, such as is observed. Good average English practice in silica material manufacture shows a content of about 30 p.ct. of cristobalite. In this connection, it is found in practice that small silica blocks are preferable to the larger blocks for combustion-chamber construction, &c., as they exhibit less tendency to expansion, by reason of the above conversions having been more efficiently brought about in the process of burning; and such small blocks are the more likely to be of homogeneous composition throughout, by reason of the more perfect and even heat treatment received in manufacture.

A retort setting being a structure, the materials forming it require, in varying degree, sufficient mechanical strength to carry the loads put upon them. The conditions under which the material is required to work, and the function it has to perform, however, vary; and it is necessary to study such conditions to determine how best to dispose the material. The portion of the setting subject to the highest temperature is the combustion chamber; so that material of the greatest refractory quality and of sufficient mechanical strength under working temperature conditions to carry the superincumbent weight of retorts and cross walls is here

required. Silica material containing from 90 p.ct. to 96 p.ct. of silica is usually selected for this purpose. Pure silica fuses at 1760° C., and silica bricks or blocks are to be obtained to withstand 1645° C. without fusion. Where high heats are practised, combustion chamber temperatures rarely exceed 1400° C.

Investigations by the Refractory Materials Committee have shown that refractoriness decreases under load, and that aluminous material is more sensitive to load than siliceous material. Coarse-grained silica is the least affected by load, and reasonably small blocks in this material are, therefore, to be preferred for combustion-chamber construction. The load on the combustion chamber of a five-tier setting does not exceed 30 lbs. per sq. in., while, in vertical-retort construction, the loads are considerably less, so that silica material of the right texture should exhibit no serious disabilities as loaded in ordinary practice. For the construction of the cross walls, material of high refractory properties is required in the zone of high temperature immediately above the combustion chamber, as, in addition to the high temperature to which it is subjected, the dust carried up from the producer is apt to set-up slagging, if the material be of indifferent quality. A good-class silica brick is best for this purpose. For the rest of the cross walls, good dense firebricks should be used to assist conductivity and furnish mechanical strength. For the outside walls, where heat retention is a factor, bricks of open texture are desirable.

The regenerator being a heat exchanger, high conductive properties are of greater importance than high temperature resistance, the temperature at this point being comparatively low. Fine-grained dense firebricks furnish the best material, which, for the open construction peculiar to the regenerator, is also desirable for sustaining the comparatively considerable load put upon it.

Under normal working conditions, the producer arch is not required to withstand a high temperature; but, in view of the possibility of complete-combustion conditions obtaining under the arch at times, it is desirable that the nostril blocks forming the key of the arch be in good silica material and as free as possible from iron content, for reasons before-mentioned. The producer arch being largely responsible for the stability of the setting above, it is important that no movement by shrinkage takes place; and the expansion of the silica nostril blocks may be useful in counteracting the probable contraction of the fireclay forming the walls of the producer. In practice it has been found desirable to construct the secondary-air ports to the combustion chamber in close-grained silica brick, which has proved less susceptible to fluxing by the dust from the setting than was the case with fireclay boxes. While the producer lining is not subject to a high temperature, the conditions are severe, by reason of contact of the material with the fuel and the slagging action set-up by the iron and alkalis of the ash. Good substantial firebricks of dense quality are here required.

In discussing the material from which to construct the retorts, it is useful to consider the varying and largely incongruous conditions which they are called upon to withstand.

(1) They must be highly refractory.
(2) They must be good heat conductors and of sufficiently close grain to minimize diffusion.
(3) They must be capable of resisting wide fluctuation in temperature.
(4) They must be of sufficient strength and wearing quality for operation by stoking machinery.

The segmented retort constructed in dense material of fairly high silica content offers the best compromise to these opposing requirements, as, though such material cannot be calculated to accommodate itself to violent temperature changes, the construction is, by reason of the large number of joints, to some extent flexible, and the rapid scurf formation in the joints ensures against leakage. If material of considerable silica content be used, it is desirable to construct the mouthpiece ends, for a length of 2 ft., in close-grained aluminous brick, in order to prevent salt corrosion so disastrous to silica brick of open texture. This is more particularly necessary where heavy charging is practised.

An exhaustive discussion of the various types and design of settings for works of varying output would furnish the subject for a paper, but it is intended to limit these remarks to horizontal settings suited to the larger works and designed for mechanical operation. The more important considerations dictating the type of setting for adoption are:

(1) The production of gas required.
(2) The ground space available.
(3) The number of retorts necessary to produce the required gas.
(4) The number, section, and disposition of the retorts in the selected setting.
(5) Grate area required and type of producer.

The required production of coal gas having been determined, the make per mouthpiece per day of 24 hours may be taken at 8000 c.ft. as a reasonably safe estimate; and from this it is possible to arrive at the number of mouthpieces. The design adopted with regard to the number and arrangement of retorts in the setting will be governed primarily by the space available. If the ground space is limited, the carbonizing capacity must be obtained either by limiting the centres of the piers of the main arches and increasing the number of tiers of retorts, or by adopting a larger retort section; while, if ample room be available, a wider spacing of the piers may be followed, and a lower setting adopted in a segmental or elliptical arch. If conditions dictate limiting the pier centres, the disposition of the regenerator and the design of producer will need such consideration as to ensure sufficient grate area being provided. A point to be noted in this connection is that the horizontal firebar grate requires about 60 p.ct. more grate area than the furnaces of the sloping-bar or grille grate types, which are so rapidly displacing the former. A simple and efficient form of such sloping bar grate is illustrated in fig. 3

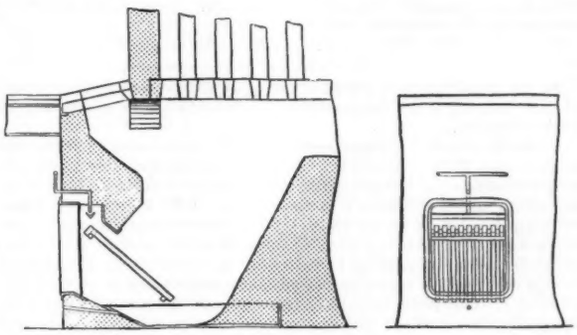


Fig. 3.—Sloping Bar Grate

In the author's opinion, this matter is worth the attention of the smaller works where generators or regenerators are in use, as, apart from the question of grate area, the operation of clinkering is much simplified; no false bars being required, and the amount of unburnt coke removed during clinkering being much reduced. Producers on each side of the setting would furnish a method of increasing the grate area, but this system should only be adopted in exceptional circumstances, as the fuel consumption is increased by this procedure.

The determination of the size of unit to be adopted is dependent upon the output of the works. Where all coal gas is made, the unit must be of such capacity as can be brought into operation, or dropped, without causing embarrassment with inflated or deficient stocks of gas. Fuel economy will, however, result from the adoption of the largest convenient unit. Where extraneous water gas is regularly made, it can be used to a great extent for cushioning the varying send-out, and the matter of the size of the coal-gas units becomes of less importance.

The setting of retorts in two vertical tiers offers so many advantages that this design should be more generally adopted. The form of combustion chamber possible with this type of setting ensures the efficient distribution of the producer gas and secondary air throughout the length of the setting, with freedom from the obstructions which in many designs are responsible for intensive local combustion, to the detriment of the even heating of the setting, and with the risk of fusion and collapse.

The section of retort for adoption raises numerous considerations. From the points of view of strength and evenness of heat penetration on full charges, the round section would be desirable; but for machine operation, the ⏢ and oval sections have been generally adopted, and variations in practice are for the most part confined to the size of the section. Where light charges of short duration are practised, the transmission of heat to the charge by conduction is aided by convection and radiation; but in the case of the heavier and longer-period charges as now more usually adopted in the larger works, the heat must be transmitted for the most part by conduction through the mass of poor conducting material, and the question of the size and shape of the retort section becomes one of increased importance.

While the material from which the retort is composed is of relatively low conductivity, it is thereby an effective storage medium for heat. The rate of heat transmission is variable, dependent on the relative temperatures of the inner and outer retort surfaces—the greater the difference, the more rapidly will the heat pass.

Lewes has calculated that the rate of heat transference during the first two hours of the charge is twice that of the fifth hour. When comparative equilibrium of temperature has been established between the outer and inner retort surfaces, the process of heat transmission reaches a minimum; and as the time of the charge is protracted by reason of the increased retort section, so does the comparative rate of heat transmission fall. In other words, the time required for the heat to penetrate the core of the charge increases disproportionately as the core is at increased distance from the retort wall.

From the standpoint of rate of carbonization and carbonizing capacity, the filling of retorts with heavy charges for 12-hour periods could not be justified were it not for the reduced decomposition of the products of distillation and the collateral advantages thereby obtained, and the saving in operation costs.

If the heat required to effect carbonization be taken at 1228 B.Th.U. per lb. of coal, a comparison of 21 ft. ⏢ retorts of 22 in. by 16 in., and 24 in. by 18 in. sections respectively, may be made as in the table herewith.

It will be observed that, if the figure of 1228 B.Th.U. per lb. of coal is not accepted, and any figure substituted, the relative comparison will not be affected. It would appear from the above

Retort Section and Heat Transmission.

—	Section of Retort. 22 in. by 16 in. by 21 ft. long.	Section of Retort. 24 in. by 18 in. by 21 ft. long.
Weight of charge	14 cwt.	17 cwt.
Heat required to effect carbonization at 1228 B.Th.U. per lb. of coal	1,925,504 B.Th.U.	2,338,112 B.Th.U.
Heat required to be transmitted per hour	160,459 ,,	194,842 ,,
Area of retort interior . . .	109 sq. ft.	120 sq. ft.
Heat required to be transmitted per sq. ft. of retort area . .	1,472 B.Th.U.	1,623 B.Th.U.

that the larger section would demand an increase of about 10 p.ct. in the rate of heat transmission to maintain the same rate of carbonization.

Coals however, vary so considerably in their resistance to heat penetration as to make it impossible to dogmatize upon possible retort sections; it being well known that coals from certain fields are much more refractory than others. The author had some experience with 24 in. by 18 in. by 21 ft. retorts carbonizing Yorkshire washed coal in 17 cwt. 12-hour charges, and at times had some difficulty in getting these charges burnt off in the period. While this section shows some advantage over the 22 in. by 16 in. section, if compared on the basis of coal carbonized per 1000 sq.ft. of retort surface per 24 hours, it may be pointed out that it gives only 70·6 sq.ft. per ton of coal carbonized per 24 hours, as against 77·9 sq.ft. in the case of the 22 in. by 16 in. ⏢-section. The 21 in. by 15 in. oval section, 21 ft. in length, however, works out at 83 sq.ft. per ton per 24 hours, but gives a carbonizing capacity of only 12 tons per 1000 sq.ft. per 24 hours.

The introduction of heavy charges has increased the importance of this question of surface area relative to retort volume. In this connection the following comparison is of interest, the horizontal retorts being completely filled by De Brouwer projector, and the duration of the charges being 12 hours.

Carbonizing Capacity, Horizontal and Vertical Retorts.

Retort.	Internal Area of Retort.	Retort Area Covered by Brickwork.	Coal Carbonized per 1000 Sq.Ft. per 24 Hours.
	Sq. Ft.	P.Ct.	Tons.
22 in. by 16 in. by 21 ft. horizontal.	109	47	12 84
24 in. by 18 in. by 21 ft.	120	47	14·15
Glover-West continuous verticals .	150	37	20 (8 p.ct. steam)

The carbonizing capacity of the vertical retort is remarkable; the power of transmitting heat to the charge being 55 p.ct. greater than the 22 in. by 16 in. ⏢ horizontal. This may be accounted for:

(1) By the manner in which the retort is heated; the active combustion of producer gas taking place on both sides of the retort, instead of one side only, as is the case with the horizontals.
(2) The greater area of retort surface exposed to the heat unprotected by cross walls.
(3) The increased conductivity of the silica material of which the retorts are composed.
(4) The absence of the cooling effect of intermittent working.
(5) The manner in which the plastic layer of extremely low conductivity is disposed, and its relatively smaller surface area.
(6) The heat conveyed to the charge by convection by the ascendingg ases and vapours.

Mr. E. V. Evans in his recent Cantor Lectures has stressed the necessity of rapid carbonization, if the maximum yield of gaseous therms is to be obtained. A digression from the limits of this paper may therefore, perhaps, be forgiven, in order to illustrate the relatively rapid carbonization in verticals as revealed by the gaseous therms obtained, by a comparison of the results with horizontals. The figures are from the works records at Norwich.

Thermal Yields of Products.—Horizontals and Verticals.

	Six Months' Working Horizontal Retorts. Full 12-Hour Charges. Coal Carbonized = 22,935 Tons.		Three Months' Working Glover-West Verticals, 8 P.Ct. Steam. Coal Carbonized = 14,230 Tons.	
	Therms per Ton.		Therms per Ton.	
Coal	306		Steam . . 306 2·03	
			308·03	
		P.Ct. of Coal.		P.Ct. of Coal.
Gas	69 83	22·82	80·29	26·06
Coke products . .	202·18	66·07	190·34	61·80
Tar	19·28	6·30	25·98	8·40
Total	291·29	95·19	296·61	96·26
Loss	14·71	4·81	11·42	3·74

The effect of raising the average temperature of the charge, with consequent accelerated speed of carbonization, is evidenced in the greater yield of volatile therms. The greater yield of tar, and its equivalent thermal value, in the case of the vertical retorts calls for comment, this appearing to be inconsistent with the high gaseous thermal yield consequent on rapid carbonization. The quality of the tar, however, suggests that the explanation that the greater yield is due to the low temperature in the head of the retort requires qualification, the characteristics of the tar being not altogether comparable with the low-temperature product. It would appear that the increased yield is due not so much to more tar being made, as to less being destroyed.

The tar vapours, as they are evolved from the depending cone of coal, would seem to take their course upwards, partly by way of the centre core of coal, and in part between the coal and the retort wall, the greater proportion by the latter route. This portion of nascent primary-tar vapour is at once exposed to a gradually increasing temperature, which, while sufficient to crack this tar, is not sufficiently high to bring about decomposition, time contact being at a minimum by reason of the full retort and the ascending water gas generated by the steam admitted at the base. The cracking of the vapours of primary tar results in dissociation into lighter hydrocarbons of lower boiling points, with a probable evolution of permanent gas. Moderate steaming appears to carry over considerable volatile matter at a temperature below that at which it would ordinarily distil, the heavier portions of which would otherwise remain in the coke. The appreciable quantities of condensates of light gravity and high boiling-point, found at the holder connections and in the distributing mains, are probably due to such products being volatile in the steam below their normal distilling points. The matter of tar yields from verticals retorts is a promising subject for detailed investigation.

Mr. G. E. Foxwell, in an interesting contribution published in "Fuel in Science and Practice," points out that "a knowledge of the path taken by the gases is of considerable practical importance, for, unless this is known, no certainty can exist as to the significance to attach to investigations concerning the formation and decomposition of the gaseous and liquid products of distillation, and the action of steam on the coking mass." Mr. Foxwell then experiments to determine the resistance offered to the flow of gas by the plastic layer of carbonizing coal, which resistance rises to a maximum as the coal is heated, and falls off as the coal is converted into the cellular structure as coke.

It will be observed that in the continuous vertical retort the outer portion of the depending cone of carbonizing coal is in a constant condition of plasticity and is static relative to the retort. The bulk of the gas is evolved in the higher temperature zone outside the plastic layer, which offers resistance to diffusion and results in the gas travelling upwards, where it receives considerable average heat treatment. The volume of gases and vapours evolved within the plastic layer is conceivably but a relatively small proportion, and the vapours only are likely to be distinctively low-temperature products.

CONSTRUCTIONAL DETAILS.

In the construction of a retort bench, the necessity for good and reliable foundations need not be enlarged upon. The importance of this matter has increased with the introduction of heavy 5-tier horizontal settings with substantial operating machinery, and still more with the adoption of vertical-retort benches with heavy concentrated loads running up to 2½ tons per sq.ft. The construction of various forms of foundations is outside the limits of this paper; and we will assume that good foundations have been provided.

The thickness of the piers will be dictated by the type of setting adopted. In the case of segmental or elliptical arches for settings of three tiers of retorts, 18-in. piers will suffice; but for settings of five tiers in semi-circular arches the additional cost of, and space required for, 27-in. piers is probably justifiable, as these allow of a more substantial arch being built, an increased area being available on each pier for the vertical thrust. The third 4½-in. ring is then carried on the pier and is supported independently of the underside 9 in. The thickness of the buttress walls at the end of the bench will depend upon the number of beds in the bench. For a 10-bed bench of 5-tier settings, 3 ft. 6 in. walls would suffice, the inner 9 in. being built in firebrick of the same quality as the pier walls, and the rest of good hard stock brick.

The pier walls having been set out on the prepared foundations, the building of the main flue follows. The dimensions of this will depend upon the number of settings in the bench and the height and dimensions of the shaft. For determining the area of the chimney and main flue, one or other of the well-known formulæ is used; but it is usually found in practice that, in the case of large benches, a main flue of rather smaller dimensions than that given by such formulæ can be adopted with success. The main flue is constructed of 14 in. of ordinary firebrick, on which three 4½-in. rings are turned on centering; openings being left for the waste-gas flues on either side for each respective setting. In the centre of the main flue a 4½-in. midfeather is built throughout the length of the flue, and is carried up the shaft to the height of the main dampers, so that each main damper independently controls the draught on either side of the setting. For the lower portions of the pier walls, refractory properties in the material are not important, this being required to stand but comparatively low temperatures. Bricks removed from such pier walls after twenty years' service have been found to be in practically the same condition as when built in, so that any good sound common firebrick may be used from the footings to the height of the first waste-

gas flue, provided it is of such a quality as will give the required mechanical strength. Above this level, and to the springing course, the best quality of firebrick should be used.

Seeing that these materials tend to contract in a varying degree, shrinkage must be provided for. The higher the piers, the greater will be the disturbance of level due to shrinkage, to counteract which a camber is built on the springing course. In the case of a 5-tier setting in a semi-arch, a camber of 3 in. in a 21-ft. length of pier has been found successful.

For the main arch, the choice of materials lies as between bricks and blocks. From the standpoint of initial cost, bricks are the cheaper, but radius blocks make the best job. If bricks be used, 9-in. bullheads of the required radius are preferable to 4½-in. arch bricks, as the shrinkage affects the stability of a 9-in. ring of bullheads in a smaller degree than is the case with two rings of 4½-in. arch bricks. The use of 9 in. radius blocks possesses the advantage claimed for the bullhead, and in addition a better bond is obtained, fewer joints occurring. For instance, it can be seen that with a bullhead 9 in. by 4½ in. by 3 2½ in. only a 2½-in. bond is obtained, whereas if a radius block 12 in. by 9 in. by 6 5 in. is adopted a 6-in. bond can be made. In this connection, the expansion of the setting lengthwise carries with it the front walls, which in turn, being built up tight under the arch, tend to carry the front portion of the arch with them, opening the joints at an increasing angle from the point where the arch begins to lose the support of the buckstay.

The effect of the opening of the joints in this way is less destructive to the stability of an arch of blocks with a large bond than is the case with a brick arch of small bond.

The idea of a cavity between the main arch and the superincumbent brickwork, for heat retention, is one of interest; but unless due allowance is made for the expansion of the cross walls of the setting, such a cavity opens the possibility of unkeying the main arch. Moreover, it is somewhat difficult and troublesome to build, and, in the author's experience, does not possess sufficient advantage to justify its adoption.

The centering for the arch is set up at about 2 ft. centres on folding wedges carried on runners; the wedges being adjusted to the cambered springing course of the piers. The mid-centering is first fixed in position, and then the two outside centerings. When so fixed, the mid-centering will thus be 3 in. higher than the two outside centerings, to conform with the required camber. The intermediates are then put into position relative to the cambered course, and the lagging nailed on. It is necessary to secure the two outside centerings, otherwise the spring of the lagging would lift them out of position. On this drum the arch is then turned. If blocks or bullheads be used, a further 4½-in. ring of arch brick will suffice. The haunch of the arch is then built in with feather-edge and splits, and two courses of firebrick cover are given to the arches, old firebricks being used for the purpose when available. The brickwork is then carried up above the main arch for four courses, with a brick on edge, in any good local brick, to finish.

The producers and regenerators are now set out and built up. In the building of the regenerator, good workmanship is essential. To this end, well-made material as to shape is necessary; the material being set in fireclay. To ensure freedom from by-passing, the joints should be as thin and tight as possible. Under working conditions the expansion of the regenerator lengthwise tends to thrust on the outside walls; and, upon dropping a setting, the joints between the walls and regenerator open, by reason of the contraction of the latter. It is advisable to examine and point-up this junction, as, at this point, considerable by-passing is apt to occur. The pointing-up is preferably done from the secondary-air side.

If the producer is properly worked as to fuel level, it is not subjected to high-temperature conditions, so that good fireclay blocks are suitable material for the construction of the producer arch. It is important, however, that this material shall not shrink unduly, as any movement will be transmitted to the combustion chamber and setting above; and to withstand the effect of the reducing atmosphere to which it is subjected on the underside, the material should be of a hard and dense quality. The nostril blocks are better constructed of close-grained silica, as the tendency of this material to expansion neutralizes the possible shrinkage of the fireclay blocks below. This material is less likely to be affected by flue dust from the producer or possible runnings from the combustion chamber or cross walls above, so setting-up slagging, as might be the case with the fireclay blocks. This similarly applies to the secondary-air ports, which are best in silica, and so designed that any fused material falling from the combustion chamber or cross walls runs away from, rather than towards, the producer nostrils, and ensures both nostrils and secondary-air ports being kept clear.

To assist equal distribution of heat throughout the length of the setting, it has been found advantageous to reduce the size of the nostrils in the centre of the setting, leaving the first four nostrils the full size of 7 in. on either side, and reducing the six centre nostrils to 4 in., 5 in., and 6 in. respectively. Similarly, in various types of regenerators arrangements are made for ensuring an even distribution of secondary air throughout the length of the combustion chamber. In the case of the "Klonne" regenerator, the secondary-air openings in the bottom uptakes vary from 1½ in. to 6 in. from the front to the centre of the setting.

The producer arch having been built, the first few courses of the cross walls are put in, and the flue below the first retort is constructed. The two bottom retorts are then built, and the combustion chamber is carried up through the setting to the height of the top of the first retort, as are the cross walls. The second tier of retorts is similarly built and the combustion chamber completed. Where moulded retorts are used, the two bottom tiers are put into position before the combustion chamber is built.

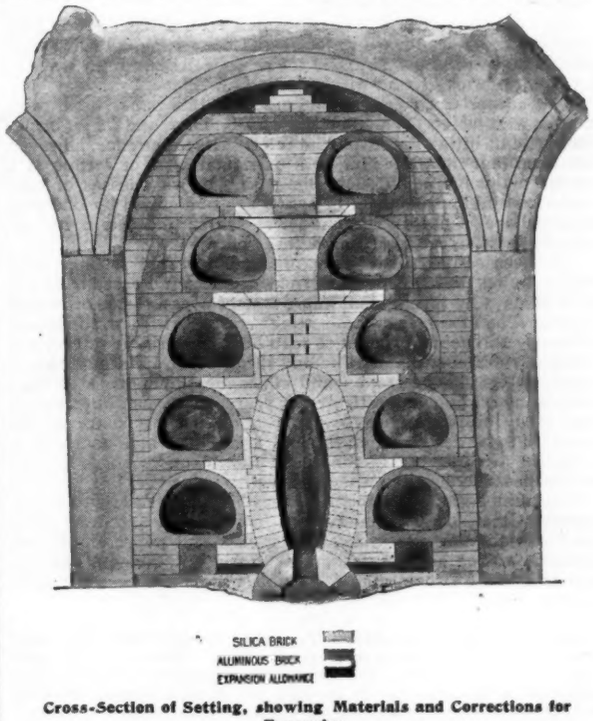
The cross walls are built in 7-in. material throughout the setting; that portion of the walls between the retorts round the combustion chamber, and to the height of the top tier of retorts, being in best silica brick, the rest of the walls between the piers and the retorts being in best fireclay material. To counteract the vertical expansion of the silica work, a ½ in. by 7 in. board is set in the course immediately under the fourth and fifth tiers of retorts, in that portion of the walls between the retorts. To meet the lateral expansion, an open joint is left in every course from the top of the combustion chamber to the underside of the fourth tier. To allow further for the upward expansion of the setting, the cross walls are built clear of the arch, this allowance tapering from 1½ in. at a point two courses above the top retort to *nil* at the level of the springing course of the main arch.

To prevent the caloric from striking the soffit of the main arch, the cross walls at the centre of the setting are covered down with tiles, and above these tiles the cross walls are continued in set-offs to within 2½ in. of the soffit. To protect the second and third tiers of retorts which come within the maximum temperature zone, silica shields are built-in 9 in. under the bottom, and 9 in. up the side, on the combustion-chamber sides. The fourth and fifth tiers are similarly protected, but under the bottoms only.

With regard to the retorts themselves, these may be either machine-made or hand-made moulded or segmented. While the latter are more expensive to adopt, the additional cost is increasingly recognized as justifiable, on the following grounds:

(1) The possibility of ensuring, with more certainty, the quality of the retort throughout its length.
(2) The distribution of expansion and contraction between a larger number of joints, thus avoiding the longitudinal cracking under temperature changes, common with moulded retorts.
(3) The retention of shape to a greater degree, throughout its life.
(4) The greater ease with which satisfactory repairs are effected.
(5) The relatively smaller leakage experienced subsequent to preliminary firing.

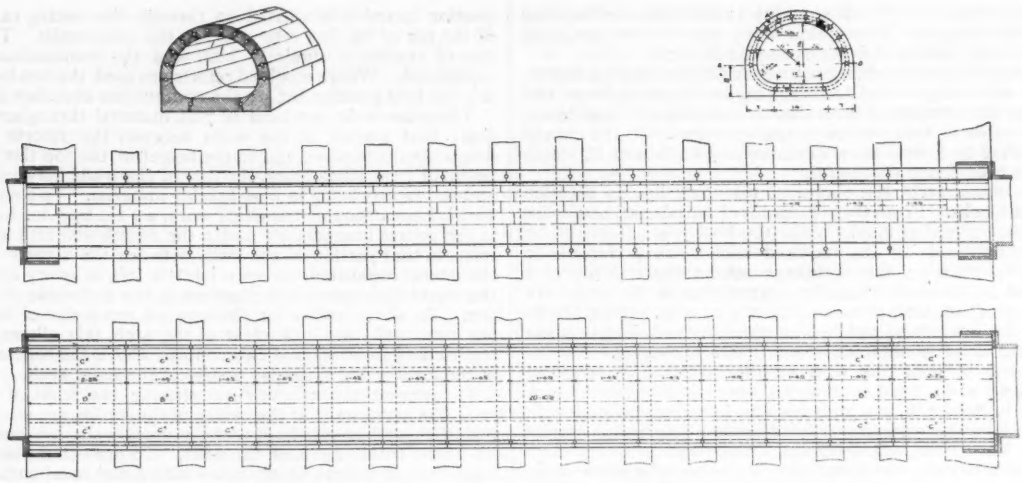
In deciding to adopt segmented retorts, it will pay for the trouble if, in addition to the drawings, full-size zinc templates of



Cross-Section of Setting, showing Materials and Corrections for Expansion.

the end sections of each block, on which proper allowance has been made for joints, are sent to the firebrick makers.

Grooves in all blocks are preferable to the tongue and groove, as it is difficult to get the blocks so true longitudinally as to ensure an exact fit of the tongue—faulty joints resulting. Furthermore, all grooved blocks are reversible, so that slight curvature in the length can be dealt with, and keying-up can obviously be more easily and effectively done with such blocks. It is essential that the jointing material for use with these blocks should be carefully chosen. A jointing composed of silica brick, firebrick, silica clay, and fireclay, in equal proportions, finely ground and



DETAILS OF 22 IN. BY 16 IN. Ω SECTION RETORTS BUILT WITH BLOCKS.

Sectional Plan on line A B.

mixed in a mill, has been found very efficient for the purpose. It is advisable to have the blocks so designed that the transverse joints all occur on the cross walls. In the case of the Ω retort, the rectangular shoulder block offers advantages over the rounded block, being more easily set and adding mechanical strength for machine operation. The shields can then be constructed of ordinary rectangular silica tiles, in place of specials.

In constructing the segmented retort, the cast-iron socket to which the mouthpiece is to be fixed is bedded on the front walls; the retort centres having been first determined and marked on the walls. The bottom tiles and shoulder blocks are set from end to end. The centering is then put into position on folding wedges on the bottom tiles; four lengths of drum centering being used for the 21 ft. retort. On this centering the retort is turned. To ensure a good job, the joints should be as thin and tight as possible, and the key a good fit, such as will go into position without being driven. With regard to relative cost, the segmented retort will cost for labour and material from 3s. to 3s. 6d. per ft. run more than the moulded retort.

The jointing material for segmented retorts has already been mentioned. With regard to the rest of the setting, all silica work should be set in silica clay, and the cross walls and front walls in 25 p.ct. firebrick ground with 75 p.ct. of fireclay.

The author is conscious that much of this paper deals with matter with which his audience is very familiar, and that it brings forward but little of a novel character. His experience, however, has been that the perfecting of a particular type of setting is a matter of evolution by such elimination of weaknesses of construction and improvement in design as are dictated by observation and experience over a number of years; and this is his excuse for putting the foregoing before you.

The average life of the 5-tier machine-operated settings, with which he has been chiefly concerned, has been increased from 700 to 2000 days by this gradual improvement over a period of twenty years. The modern vertical settings started with the advantage of nearly 100 years' experience with horizontal retort setting and study of refractory material behind them, which in large measure accounts for the perfection and efficiency which these settings have attained in comparatively few years. By close observation and study of our settings we may still earn our share of the pleasure to be derived from the improvements which continue to be made year by year in the art of retort construction, for the end of possible development is not yet.

The author gratefully acknowledges his indebtedness to his respected Chief, Mr. Thomas Glover, for permission to draw upon the Norwich Works for matter included in this paper, and for his valuable advice and interest; also to Messrs. Weston, Phillips, and Hadfield for their willing assistance in compiling the necessary material.

Discussion.

Mr. P. D. Walmsley (Great Yarmouth) thought the paper they had just listened to was a very valuable one. The author had gone deeply into the subject, and there was an amount of information furnished which ought to be of great use to all of them. Dealing with the expansion of siliceous materials, Mr. Harston said: "Upon subsequent protracted exposure to high temperatures in the settings, some further conversion takes place, with consequent expansion, such as is observed." What he was wondering was whether this expansion could not be brought about by the firebrick makers themselves, by heating the material to the necessary degree, so that the firebricks as the users received them would be fully expanded, and no further expansion would take place. Of course, it might be costly to do this; but it seemed to him that the expansion might be done for them. Later the author said: "The segmented retort constructed in dense material of fairly high silica content offers the best compromise to these opposing requirements, as, though such material cannot be calculated to accommodate itself to violent temperature changes, the construction is, by reason of the large number of joints, to some extent flexible, and the rapid scurf formation in the joints ensures against leakage." Did he mean by this that the silica material could not be depended upon to accommodate itself to violent temperature changes, or was it only a relative expression in regard to fireclay material? In estimating the production of coal gas required, Mr. Harston was very modest in only claiming 8000 c.ft. per mouthpiece per day. At Yarmouth they had settings which were producing 11,000 c.ft. per mouthpiece daily—settings of six horizontal retorts 24¼ in. by 18¼ in. were producing 130,000 c.ft. per day. Then as to the sloping bar grate, he did not know the period of cleaning and clinkering which obtained at Norwich, but there were at Yarmouth grates of a certain proprietary make in operation, and the cleaning period was about every three or four months. In fact, he hardly knew when they did clean them. Then the author stated: "From the standpoint of rate of carbonization and carbonizing capacity, the filling of retorts with heavy charges for 12-hour periods could not be justified were it not for the reduced decomposition of the products of distillation and the collateral advantages thereby obtained, and the saving in operation costs." Personally, he thought these advantages were quite sufficient to determine the question of heavy charges.

Mr. J. W. Auchterlonie (Cambridge) also congratulated Mr. Harston, and expressed the hope that the Association would have from him further contributions in the future. Beginning with Grafton's time in 1820, the author went on to give them a very full summary of up-to-date gas-works practice as relating to carbonization. Mr. Walmsley had referred to the expansion of firebrick. The matter really related to silica here, and Mr. Harston said the changes were not reversible. It seemed that, if the makers could fire the bricks to 1470° C., they would not have any further expansion of silica.

Mr. Walmsley: That is the very point I am trying to get at.

Mr. Auchterlonie (continuing) did not know that they really did get it, judging from a setting he had just taken out. Not only the nostril blocks but even the adjoining rings should be silica; every piece of brickwork in the combustion chamber ought to be of silica. The trouble of salt on the mouthpiece of silica retorts could be overcome by fireclay mouthpieces 2 ft. long, where the heat was not quite so strong, and bolting-on the iron mouthpieces. The author said: "The time required for the heat to penetrate the core of the charge increases disproportionately as the core is at increased distance from the retort wall." It seemed to him that this was rather an argument against Mr. Walmsley's contention that twelve-hour charges were an advantage. Personally he thought there were many disadvantages attaching to charges of this duration—of course, he recognized the labour advantages. In the comparison of thermal yields of products between horizontals and verticals, there was no mention of temperature. Then, just previous to this, the author gave as an argument in favour of verticals the increased conductivity of the silica material of which the retorts are composed. Why could they not have horizontal retorts made of silica? This would enable them to work at increased temperatures. Without the temperature figures being given, it was a little difficult to see whether the author's vertical and horizontal results were strictly comparable. With regard to the camber in the arch of a five-tier setting, he might say that he had recently built eight beds of eight retorts in four tiers, and he put in a cambered arch; but it did appear that the advantage of the camber—that was, 3 in. camber in the centre of the arch to the outer wall—might be discounted by the difficulty of getting a tightly keyed arch. This might outweigh the advantages of allowing for expansion. He had had beds of three tiers in use for twenty years, and could not see that the camber was really necessary. If the blocks were properly keyed up, he did not know that any sagging in the centre of the arch should take place.

Mr. J. R. Bradshaw (Retford), while admitting that the comparison of thermal yields of products between horizontals and verticals was very interesting, remarked that it left them, in a way of speaking, as they were before—still guessing, not as to the accuracy of the figures, but with regard to what was the best line to take for the future. It was all very well to say that verticals had a hundred years' experience of horizontals behind them, and so had a good "send off;" but while they expected further improvements on the present excellent working of verticals, there was equal reason, in spite of their hundred years' existence, to anticipate improvement in the results from horizontal retorts. The author gave the thermal loss as 4·81 p.ct. in the case of horizontals, and 3·74 p.ct. for verticals—a difference that might prove negligible in practical working.

Mr. R. G. SHADBOLT said the paper comprised a number of subjects which it was very difficult to place in their respective positions and to apportion their respective values. The author was to be complimented first upon his summary of the work that had been done in connection with the application of refractory materials to retorting processes, and secondly with regard to the intelligent interpretation which he had placed upon the results. The paper was a mass of fact, theory, and vision. This was the impression which it left upon his (the speaker's) mind—and on so short an acquantaince with the paper, it was only an impression of this kind to which one could give voice. Engineers would find their experience corroborated in various parts of the paper. To one who hailed from Cambridge, and who was the fourth generation in direct line of Cambridge gas men, the starting-point of Grafton's retort was necessarily of interest. His forbears and himself had been, from that time to the present, carried along that line of development which had been so ably laid down to them in the paper that day. As to the application of refractory materials generally, this was a subject which only in comparatively recent years had seriously engaged the attention of the technicians of their industry; and the industry was to be congratulated upon having young men occupying the positions they did now, who were able to bring up to date a subject so complicated, and to place their facts, their theories, and their ideas so lucidly before their fellows as Mr. Harston had just done. The paper bristled with technical matter of all kinds which had in the past of necessity been dealt with on more or less rule-of-thumb lines. He took one indication of this paper as being the great advance made in the technical education of the rising generation of gas engineers, and from this he took heart, and felt they might look forward with confidence to the future.

Mr. THOMAS GLOVER (Norwich) was very glad to have the opportunity of expressing his great pleasure at the type of paper which Mr. Harston had prepared for this meeting. Towards the end, he said: "The author is conscious that much of this paper deals with matter with which his audience is very familiar, and that it brings forward but little of a novel character." This was only partially true, he thought; but even if there were in it little possessing a novel character, the author had managed to bring it forward in a very fresh way, and to make it particularly interesting—emphasizing points which they were apt to overlook in ordinary every-day practice. He would like to add his compliments to those already passed, if it would not be out of place to do so. He was Mr. Harston's Chief, and he had helped him a little in his training; and he was bound to say that he was proud of his pupil. He trusted that he would go on from the good beginning he had made, and give the industry the full benefit of his quick brain and his keen research. It had been suggested that the grate referred to in the paper was an adaptation of the "Sydenham" grate, but this was not the case. The sloping bar grate, not absolutely the same as shown here, but almost the same, was introduced by Mr. Samuel Glover, at St. Helens, in 1887, and developed further by him (the speaker) at Carlisle in 1892 and 1893. So they would see it was not fresh; but it was fairly new at Norwich, and came in very useful to them when they wanted to get higher temperatures than the older fashioned furnace with almost horizontal bars would give them. It afforded a bigger grate area, and it was a substantial advantage that one did not need to use false bars. One just pushed the clinker down, and scooped it out from the ashpan. The bars were never moved; so that some would say it never was clinkered. It was only necessary to work the clinkering bar through the sloping bars, and, as he had said, scoop out the ashes from the bottom. In the matter of the size of horizontal retorts, he was with Mr. Harston as to area and the work one got out of them. He thought the limit of economical size was soon reached, and his experience led him to put the limit at this: How small a retort could a man get inside to point? A moderate sized retort was really a better instrument than a larger one. The sectional plan in the paper showed 22 in. by 16 in., and he should continue in horizontal practice to use this section. He had tried larger ones, but had come back to this size. The method of construction was worthy of consideration. With moulded retorts one was often confined to ordinary fireclay, whereas in the case of segmental retorts one could have the choice of more refractory material—any degree of silica one cared to use. He found that somewhere in the neighbourhood of 90 p.ct. silica answered his purpose. It was mechanically strong, and was sufficiently refractory.

The PRESIDENT (Mr. E. F. Keable, of Gorleston-on-Sea) said Mr. Harston referred in his opening remarks to the fact that he (the speaker) was responsible for inviting him to contribute a paper. The members must now all be pleased that he did so, for it was certainly a paper they would cherish for many a long day to come. Allusion was made in the paper to the action of salt; and he could fully bear out what was said on this subject. His own settings were on a level with the bed of the river, and he was subject to silt from salt water there. He had had considerable trouble with this salt, by reason of its destructive action. In the matter of the sloping bar grate, he could also fully support the author, having himself experimented with this system for some length of time. For smaller works it had all the advantages Mr. Harston indicated. Of course, they must all realize that they had in this paper to a large extent the results of research on a big works, and those connected with the smaller undertakings particularly appreciated the bringing-forward of such matters. It was only the bigger works that could possibly go into things in such detail.

Mr. HARSTON, replying to points raised in the discussion, said that at one time at Norwich they were using very much larger blocks for their combustion chambers; but they thought that, with such a large block, to ensure equal heat treatment in the process of burning at the makers' works, the firing would have to be very protracted, and would prove expensive for the manufacturers, and so they ran the risk of the core being imperfectly burned. By the adoption of the smaller block, they had a much better chance of the conversions referred to in the paper taking place at the makers' works. With the smaller blocks, they found they got much less expansion than they used to do with the larger ones. The material they were using for the construction of their segmental retorts contained 82 p.ct. of silica. Considering the conditions the retorts had to stand, they could not have a material that would answer all requirements, and so it had to be a compromise. It was suggested that the segmental retort was the better to adopt. This was their experience. A make of 8000 c.ft. per mouthpiece would be 160,000 c.ft. per day for the whole bed. Of course, in taking out an estimate of production of gas, one would naturally adopt a figure on the low side, and this was doubtless the case with the one he had given. In Norwich they had been working their horizontal retorts with West compressed-air machinery, six-hour charges. They went in one or two stages to twelve-hour charges, and it really reduced the carbonizing capacity of the plant. On the other hand, taking the efficiency of carbonization over all, they effected a considerable improvement, though the capacity of the plant from the point of view of coal carbonized per day was reduced. The collateral advantages gained by the adoption of twelve-hour heavy charges, and the saving of operating costs, did justify this system. The amount of decomposition was considerably reduced, and this alone justified it. As to relative thermal losses, the point was that with verticals one was getting 80 therms per ton in gas, and with horizontals only 70. This was a very great advantage, and commercially it was the main feature of the process. The hottest part of the vertical retort was about the third combustion chamber from the bottom, which registered something like 1340° C. The horizontal combustion chamber averaged throughout the length would be 1320° C. If they took the average through the length of the vertical, it would not be any higher than this. Going up the vertical retort, the temperature fell until it got to about 800° C. The question of silica horizontal retorts had come forward recently, and was open to a good deal of argument. The suggestion was that if they adopted pure silica they could afford to raise their temperatures, and so obtain better results. If they did so increase the temperatures, what they were getting off in twelve hours with horizontals they might get off in ten-and-a-half hours; but this would be inconvenient. The matter was, however, being closely followed up at the present time.

A NEW USE FOR GAS.

THE POSSIBILITIES OF ITS EMPLOYMENT FOR VACUUM CLEANING.

By BERTRAM C. JOY, A.M.I.Mech.E.

Anybody interested in any way in the use of gas will be glad to hear of some possible new application of this useful commodity, for such an application must bring with it the use of a greater quantity of gas—which is advantageous to all concerned with its supply; it must, by the introduction of new apparatus, tend in a small way to increase employment among engineers of a certain class; and the sale of the apparatus, and fitting-up of the whole plant, must obviously further tend to increase employment among certain sections of the public. If, therefore, it can be shown that there is some possibility—perhaps probability—of gas being brought into future use for a purpose for which it has not so far been employed on anything but a purely experimental scale, then these notes will have served the writer's purpose.

It is somewhat extraordinary that, while there are very many different patterns of vacuum cleaning machines driven by electricity, so far no gas-operated machine has been put upon the market. A well-known London gas supply undertaking advertises on its meter cards—gas for lighting, heating, cooking, hot-water supply, and power. But no gas company in the Kingdom claims that its gas can be used for *cleaning*—a highly important detail of domestic economy, and one which till now has been entirely in the hands of concerns supplying electric current.

As a matter of fact, the small fan or blower of the electric machine is particularly suited to electric motor drive; and no such fan could be driven so well by any form of gas-motor at present known. It would therefore be ridiculous to attempt to imitate the general principles and design of the electric blower machine in the case of an apparatus intended to be operated by gas. The gas-machine must owe its performance, directly or indirectly, to the combustion—rapid or otherwise—of a certain volume of gas; and hence there must be flame, heat, and products—just as in the gas-cooker, the water heater, or fire. The possibility of making a small machine on the lines of the electric suction cleaner is therefore very remote, for the flame would be dangerous, and the fumes objectionable. It appears that nearly the same remarks apply if the machine be what one might call the "semi-portable" type—that is, a type of machine which, though not having to be moved about the room where cleaning was taking place, would in any case need to be moved from room to room, the actual cleaning part of the apparatus, or the nozzle (carpet tool as it is sometimes called), being connected to the vacuum supply machine by a short flexible pipe. This system would necessitate the shifting about of perhaps a fairly heavy machine, and also the use of a portable apparatus burning gas, having a temporary flexible gas connection—a source of danger in itself.

Considering the above facts, there does not seem room for doubt that, in the case of the gas cleaner, the part of the machine, whatever its nature, which is responsible for producing the vacuum must be permanently fixed in some convenient, and preferably central, position. This is the more desirable when we recollect that there may be exhaust gases or products of combustion to get rid of, and further when we bear in mind that a certain quantity of water may be necessary to assist the cooling of the apparatus.

Now there appear to be not more than four methods by which a sufficient vacuum for effective cleaning could be produced—each of them employing the use of a permanently fixed machine

as described in the last paragraph. These are: A steam ejector, a small gas-engine, a hot-air engine, and the direct explosion system.

We will take these in turn, and briefly discuss each. It is possible to produce a high degree of vacuum by means of an ejector operated by a steam jet. The ejector used so much on the railway in connection with the vacuum brake is an example, and the system is in actual use in the case of a certain house-to-house machine, which some may have seen standing in the roadway outside a building, with its vacuum pipe passing into an upper window. A machine embodying this principle has actually been tried in a fairly large building, though with what degree of success is not known. When last the writer visited the building the cleaner had been removed, so that presumably some difficulty had been experienced. When we consider the domestic machine, it is probable that the steam pressure in the boiler would have to be in the region of 50 lbs. per sq. in.; and this would entail the use of a fairly well made steel boiler. This boiler would need to be inspected at regular intervals, and would probably require more skilled attention than could be given to it in the average household. Doubtless, automatic regulation of the gas to suit the boiler pressure could be provided, as well as automatic water supply. But even so, a boiler filled with steam at 50 lbs. pressure is not a desirable kind of appliance to fix in a small house, and to put under the charge of some person who, sooner or later, will probably commit a blunder which will damage the boiler—and perhaps also the building which contains it. There is an ever-present danger in a system requiring the use of a steam boiler, which is entirely absent in the case of the three other systems mentioned.

Regarding the use of a gas-engine, the explosion danger is entirely eliminated, but the question of management of the engine and its blower or vacuum pump is perhaps not a much easier problem than in the previous case. The whole plant would need to be on a small scale. At the same time all the accessories of a large installation would require to be present. There would be some difficulty in designing a small installation that would be sufficiently simple to handle, that would be reliable, compact, free from breakdown, and, in short, that would constitute a safe, simple, and inexpensive apparatus to place in the hands of the public. The gas-engine is the best medium for converting gaseous energy into rotary motion for driving a machine, but it has too many moving parts and too many essential fittings and accessories to render it a suitable domestic motor.

The hot-air engine has many points to recommend it. It is safe and simple, it is a low-pressure machine, so that there is no danger, and there is very little wear of the parts. It is easily started and needs no attention. Indeed, it has everything to recommend it as a domestic motor save this one feature—that it is enormously bu ky for the amount of power developed. Naturally, its bulk gives rise to a fairly high initial cost. The initial cost of an engine sufficiently powerful for domestic vacuum cleaning might perhaps be as much as £50. There would then be the additional cost of a blower or exhauster. The writer believes that the hot-air engine has never been applied to the purpose of vacuum cleaning; and the reason is beyond doubt owing to its great bulk and cost, in proportion to its developed horse-power.

We now arrive at the fourth method set down in the list—the direct explosion method. Instead of exploding gas and air behind a piston connected to a crank by a connecting rod, and rotating a crank-shaft and flywheel, and thereafter driving an exhauster in the method referred to, the exploding gas acts directly upon the air to be exhausted, without even the intervention of a piston. Thus the piston, connecting rod, crank shaft, and flywheel of the gas-engine all become unnecessary; and the only moving parts are the valves for discharge and admission. It is not easy to imagine any more simple apparatus for exhausting air by means of coal gas; and the boiler danger is entirely overcome, because the maximum pressure possible is known, and the combustion chamber can be easily made strong enough to withstand this. Heat will be generated by the combustion, and if water is not used as a cooling agent, the parts may become dangerously hot; but this water when heated can be made use of for domestic purposes. Thus the use of water in any gas-operated machine, whatever its design, appears to be rather in the nature of an advantage than the reverse. Indeed, it seems possible that, in the case of the breakdown of other water-heating appliances, such a machine as described could be made use of, and thus a double purpose would be served. Of course, there are the exhaust gases to deal with, but a small pipe suffices to get rid of these, and discharge them into the outer air. Moreover, the cleaning of the filters of vacuum cleaners—usually a dirty and unpleasant operation—can be performed by holding the filter close to the exhaust outlet.

It is not intended in these notes to describe this machine more fully, as it has already been referred to in the columns of the "Journal" (Oct. 12, 1921). The principle involved appears to be sound, simple, and safe, and seems to be the solution of the gas domestic cleaning problem.

The writer has already referred to the fact that a fixed plant was to be preferred to any other, because the use of gas seems to demand such an arrangement. It is clear that a stationary position of the machine will necessitate a fairly long vacuum or "cleaning" pipe; and though this has certain disadvantages, it introduces one very important feature—a feature which, in the writer's opinion, gives the fixed machine, whether electrically or gas driven, an outstanding advantage over the well-known type of electrical machine. The latter is provided with a large filter bag into which the air and the dust drawn from the carpet pass. The air passes through the fabric of the bag, but the dust is prevented from doing so—the mesh of the fabric being sufficiently small for this purpose. Though the mesh of the fabric is small, microscopically it is large; and there does not seem to be any doubt that disease germs picked up with the dust from the carpet and other places, far from being stopped by the fabric, are violently blown through it by the discharge of the fan or blower, and are distributed about the room in just such a fashion as to be breathed into the throat or nostrils of any person present. Indeed, if such germs are harboured in the dust of living rooms—and there seems no doubt that they frequently are—the usual type of electrical machine appears to be a device to "broadcast" them.

Germs that pass through the filter screen of the type of gas-appliance which has been briefly described are not blown into the atmosphere of the room, but are violently drawn along the vacuum pipe, and after passing through the blower, could be discharged into the outer air. In the case of the last-described machine, any foreign matter passing the filter would be drawn with the air into the explosion chamber of the machine, and subjected to a high-temperature flame, before being discharged into the outer air. Surely this is a very important point, and one that should popularize the gas machine among thinking people.

There is much disagreement among makers of vacuum-cleaners as to whether volume of air or high degree of vacuum is most essential for effective cleaning. Some hold that a big volume of air is necessary, some that a high vacuum is the thing to aim at. As a matter of fact, if a large amount of cleaning has to be done in a short space of time, both volume and vacuum are necessary. These conditions would not apply in the case of the domestic cleaner, where it seems that gas would be likely to be of most value. The writer's experience goes to prove that for domestic work large volume is really not necessary, but that a fairly high vacuum—(say) 30 in. of water—is required to draw the fine dust out of the carpet. A large air volume is not much use unless this air passes in close contact with the carpet—if not actually through it. In the majority of electrically driven cleaners, the "nozzle" is raised a quarter of an inch or more above the carpet, and it seems reasonable to suppose that, generally speaking, cleaning would be equally effective if the space between the nozzle and the carpet were one eighth of an inch only, and the volume of air were to be halved. It is important to remember that, whatever the source of power, it is the kinetic energy of the air which actually removes the dust and does the cleaning, and that vacuum (or partial vacuum) is necessary only to give rise to an air flow to produce this kinetic energy.

It has already been pointed out that in the case of the gas-machine a fairly long cleaning pipe forms part of the apparatus; and for various reasons this should preferably be a small diameter one. Such conditions are suitable for fairly high vacuum but are not so well suited to volume; if, therefore, high vacuum is available, and a type of nozzle is used which rests close down on the carpet, the velocity (and therefore kinetic energy) of the air passing between the edge of the nozzle and the surface of the carpet can be very high indeed. The writer's experiments have shown that these conditions produce very effective cleaning in the case of average domestic work, where the dust appears to consist mostly of minute pieces worn from clothing, carpets, and other fabrics, and a certain quantity of fine road and other dust.

It seems then that the gas vacuum cleaning plant will have to consist of a fixed power plant for producing the vacuum, a fairly long flexible cleaning pipe, a filter chamber or dust collector,* and a floor nozzle of the type employed in hand machines. There does not appear to be anything objectionable in any of these features. The power plant need be no larger than the average geyser or gas-boiler, the cleaning tools and dust filter can be normal, and the cleaning pipe should not prove objectionable. (Of course, this feature would appear at first a little unusual, but presumably the garden hose must have been regarded in a similar fashion by the first users of these useful garden adjuncts. Indeed, the same attitude is met with in the case of any and every new appliance.)

The whole gas cleaning problem is not at all insoluble, as certain lengthy experiments have already shown; and the application of gas to this use, and its appreciation by the public, depend not a little on the interest of those people who will largely reap the benefit of the innovation—the gas supply undertakings.

* This chamber can be at either end of the pipe. The writer considers that near the nozzle is the best position for it, for then no dust passes through the pipe, and blockage is impossible.

Wales and Monmouthshire District Institution.—There is to be a meeting next Wednesday (May 28), at 11.15, in the Guest Memorial Hall, Dowlais, of the Wales and Monmouthshire District Institution of Gas Engineers and Managers, under the Presidency of Mr. W. C. Jackson, of Neath. The agenda include a paper by Mr. C. Bateman, F.C.S., of Cardiff, on "The Manufacture and Neutralization of Sulphate of Ammonia." At the close of the meeting the members will be the guests at luncheon of the Chairman and Directors of the Dowlais Gas and Coke Company; and afterwards, by permission of Messrs. Guest, Keen, and Nettlefolds, Ltd., a visit will be paid to the Dowlais Steel Works.

EXAMINATIONS UNDER THE EDUCATION SCHEME OF THE INSTITUTION OF GAS ENGINEERS.

Mr. Walter Hole, Organizing Secretary to the Education Scheme of the Institution of Gas Engineers, writes as follows regarding the first examinations:

The first examinations under the education scheme of the Institution were held on the 3rd and the 10th inst., and I have pleasure in forwarding for insertion in your next issue a copy of the questions set in each of the five divisions. There were no candidates for the Diploma in Gas Supply.

The Examiners were, as you know, for Gas Engineering, Messrs. H. D. Madden, M.Inst.C.E. (Cardiff), W. J. Smith, B.Sc. (Bolton), and J. S. Thorman (London); and for Gas Supply, Messrs. S. B. Chandler (Tottenham), Stephen Lacey, B.Sc. (London), and J. Wesley Whimster (Bath).

The total number of candidates examined was 60, of whom 36 were in Section I. and 24 in Section II. of the scheme.

THE QUESTION PAPERS.

Gas Engineering.

ORDINARY GRADE—SECTION II.

(*Eight questions only to be attempted.*)

1. Describe the general characteristics and properties of a gas-making coal, and the effects of storage on same.
2. Describe, by the aid of sketches, the principles of a regenerative retort setting, and discuss the producer reactions.
3. Sketch a cross-section of a horizontal retort, showing how the mouthpiece, ascension and dip pipes, and hydraulic main are fitted together. Explain the function of the hydraulic main.
4. What is the duty of the condenser? Explain fully and sketch a type you are familiar with.
5. State the effect of an exhauster on a gas-works. How is the speed of an exhauster governed. Explain this by a sketch.
6. Give an account of the impurities in coal gas at the outlet of exhausters. (*a*) Describe by what methods the ammonia in the gas is removed. (*b*) Describe a test for the estimation of ammonia in ammoniacal liquor, and sketch the apparatus.
7. Give a description of the process of dry purification of coal gas, stating the reactions that occur; and sketch a cross-section of a purifier.
8. Describe by sketch the process of manufacture of carburetted water gas, giving chemical reactions.
9. Give an outline sketch of a two-lift gasholder and tank, and show how the inlet and outlet pipes are arranged.
10. Describe the tests usually employed to check the value and constancy of the gas supplied to a town.

HIGHER GRADE.

(*Eight questions only to be attempted.*)

1. Give a cross-sectional sketch, with figured dimensions, of a regenerative setting of horizontal retorts, indicating the direction of flow of the producer gas, secondary air, and waste gases.
2. Describe the process of heating-up a bed of vertical retorts from cold, giving average analyses of producer and waste gases, and stating the temperatures usually maintained in the various combustion chambers.
3. Give an account of the physical and chemical changes occurring during the carbonization of coal in horizontal retorts, and state the effect of variations in temperature on the gaseous and liquid products obtained after condensation.
4. Describe with the aid of sketches the construction and working of a machine for charging and discharging horizontal retorts.
5. Describe the process of manufacturing carburetted water gas, giving the chemical reactions occurring in the generator, and the various steam and blast pressures in each section of the plant.
6. Give dimensioned sketches of the plant required for complete condensation for a make of 50,000 c.ft. of crude coal gas per hour, measured at normal temperature and pressure.
7. Describe the plant required for the complete removal of ammonia from crude coal gas, giving the amount of ammonia and sulphuretted hydrogen, in grains per 100 c.ft., at the inlet and outlet of each section of the plant.
8. Describe the method of working a series of oxide purifiers for the removal of sulphuretted hydrogen, stating the chemical changes involved in the process.
9. Give sketches showing the construction of the plant required for the production of neutral sulphate of ammonia from crude gas liquor.
10. Describe the apparatus required and the method employed for the complete analysis of town gas.
11. Describe the method of determining the calorific value of gas, and calculate the calorific value of the following sample:

	P.Ct.
Carbon dioxide	3·5
Unsaturated hydrocarbons	2·2
Oxygen	1·0
Carbon monoxide	10·0
Methane	26·4
Hydrogen	46·5
Nitrogen	10·4
	100·0

12. Describe fully the method of making a proximate analysis of coal.

DIPLOMA COURSE.

(*Eight questions only to be attempted.*)

1. State what steps you would take in the selection and valuation of coals for gas-works use, having regard also to commercial value, storage, &c. Give full reasons.
2. You are placed in charge of a horizontal retort house, comprising (say) 20 settings of retorts, machine-stoked, regenerator furnaces, and general modern equipment. State the policy you would adopt, and the details you would observe, to obtain the maximum yield per ton of coal carbonized, and to attain the highest all-round efficiency. State fully your reasons for each detail.
3. Sketch a cross section of a setting of eight retorts in four tiers complete with producer and regenerators. (*a*) Indicate the temperatures you would expect to find in full and proper working conditions. (*b*) Indicate the class of material you would employ in the different zones. (*c*) Give the approximate analysis and temperature of the exit flue gases.
4. The problem of waste heat is now receiving considerable consideration in gas-works practice. Discuss fully where heat losses occur in actual daily practice, and by what means same may be (*a*) recovered, and (*b*) minimized.
5. Describe fully the working and control of a carburetted water-gas plant, and the chemical and thermal reactions occurring during the blow and gas-making cycles.
6. Describe by means of a sketch how the sensible heat of the blast gases can be recovered in a carburetted water-gas plant, and discuss fully the merit and effect of such procedure on the fuel account.
7. Explain fully the starting-up and working of a setting of vertical retorts with which you are familiar. Describe the physical and chemical changes that the coal and gas, &c., undergo during the process of carbonization in vertical retorts, and the effect of steaming on same. Illustrate the zones by sketch.
8. Sketch a plant for the manufacture of neutral sulphate of ammonia, and describe the working process from a chemical control point of view.
9. It is essential that the supply of gas to a district should be regular and constant. (*a*) Sketch and shortly explain the duty of the station governor towards this. (*b*) Discuss fully what tests or examinations you would regularly make on the gas supply to this end, and state reasons. (*c*) If naphthalene be present on the district, what immediate curative or relief steps would you make at the works?
10. The Gas Regulation Act came into force in 1920. Describe generally the conditions entailed, and discuss its effect on the methods of gas manufacture, procedure, and supply to consumers.

Gas Supply.

ORDINARY GRADE.—SECTION II.

(*Eight questions only to be attempted.*)

1. Describe, with sketch, the operation of cutting out a 4 in. cast-iron main and inserting a 4 in. by 4 in. T, without interfering with the supply of gas. What tools and materials would be required?
2. How is a steady and regular flow of gas provided for in the design of a dry meter? What are the factors limiting the working capacity of a dry meter, and what is likely to be the effect of over-driving?
3. Make a sketch (about half full-size) of any inverted burner with which your are familiar. Name, and state purpose of, each part, and specify the materials of which it is made.
4. What do you understand by the law of "inverse squares"? What is the illumination upon a surface 50 ft. distant from a source of light of 150-candle power?
5. Describe and compare two systems of distant control of gas lighting and extinguishing. In what circumstances would you recommend their use?
6. Make a sketch and describe a gas-heated hot-water apparatus suitable for connection to draw-off pipes serving bath, lavatory basin, and sink. Give capacity of hot-water storage, sizes of flow and return pipes, and maximum rate of gas consumption per hour. What do you understand by an "economy valve"?
7. What are the essential features of the bunsen flame burner? Explain how the great advances made in the gas industry have been dependent upon the use of such burners, and say why it is that for some types of gas heating apparatus the luminous flame burner is still preferred.
8. Describe and explain the uses of the principal parts of a modern gas-fire. What do you understand by radiant and convected heat, and in what proportions are they emitted from the fire above-mentioned?
9. What are the common defects of chimney flues when used in conjunction with gas-fires? Describe, with the aid of sketches, how you would deal with them.
10. Compare the cost of heating rooms by coal, gas, and electricity on the basis of coal at 45s. per ton (13,000 B.Th.U. per lb.), gas at 8d. per therm, and electricity at 2d. per B.O.T. unit.

HIGHER GRADE.

(*Eight Questions only to be attempted.*)

1. Say what you know of the mechanical stresses and corrosive actions to which gas-mains may be subjected after being laid in the ground. With these considerations in view, discuss the relative merits of cast iron and steel for gas-pipes, and enumerate the points to which you would pay particular attention when laying cast-iron mains and steel mains respectively.
2. Dr. Pole's formula is $Q = 2320 \frac{hd^5}{SL}$ where

   Q = discharge in cubic feet per hour,
   h = loss of pressure due to friction between ends of pipe in inches of water,
   d = diameter of pipe in inches,
   S = specific gravity of gas as compared with air,
   L = length of pipe in feet.

   If a 10-in. main rises 300 ft. in the course of its length of 10,000 ft., and the gauge pressure at the beginning and end is the same (say, 4 in. water column), what will be the velocity of flow in feet per second, given that

   Specific gravity of the gas as compared with air = 0·60.
   Specific gravity of water as compared with air = 800.

3. An estate of 2000 small houses is supplied from one distributing centre connected to a gas-works 3 miles distant by a main used for no other purpose than to carry gas to the estate. The maximum rate of demand is 40,000 c.ft. per hour. Assuming that at this rate the initial pressure in the main required to maintain 6 in. of water at the distributing centre may be taken as 12 in. of water if the main is 12 in. in diameter; 3 lbs. per sq. in. if the main is 8 in. in diameter; 40 lbs. per sq. in. if the main is 4 in. in diameter: (*a*) Briefly describe the gas-compressing plant best suited for each set of conditions. (*b*) What considerations would influence you in determining the size of main it would be most economical to lay?

4. Define "unaccounted-for gas." What are the various factors that make it up? Discuss their relative importance and the way in which they are affected by local conditions. Having regard to cost, what steps would you propose taking towards the elimination of "unaccounted-for gas"?

5. Recurring complaints of bad supply at specified times are received from an all-gas house, the gas-consuming appliances in which are known to be properly adjusted and in good working order. If practically all the pipes are hidden and cannot be exposed to view, explain precisely how you would proceed to determine in what respects, if any, the installation is inadequate. You are provided with pressure-gauges, and given facilities for attaching them to nipples on the inlet and outlet of the meter and on the run of the pipe at the inlet to each appliance. It may be assumed that the pressure in the main is unaffected by changes in rate of gas consumption in the house. Show, also, how the size of each section can be deduced.

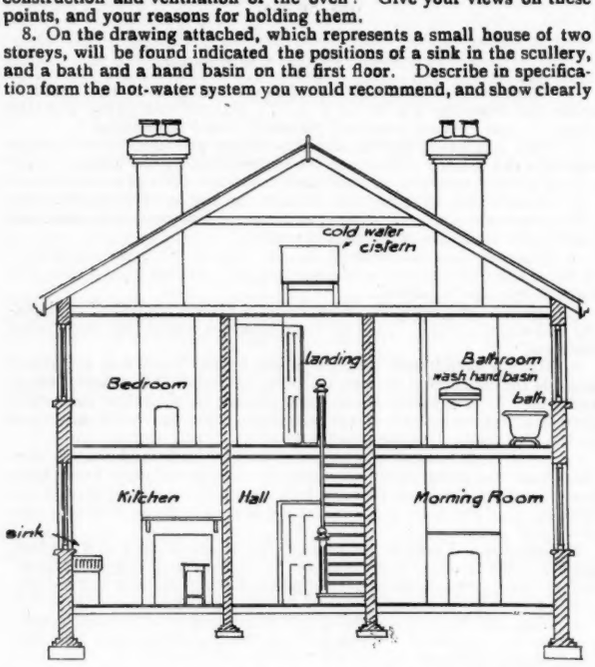
[A diagram indicated the disposition of piping and appliances.]

State what you consider to be the minimum pressure allowable at D, and the corresponding pressures at A, B, and C.

6. Discuss a proposal to reduce the calorific value of a town's gas from (say) 500 to 450 B.Th.U. per c.ft., under the following headings: (*a*) The relation between the pressure at the outlet of the works or district governors and the pressure at the gas consumers' appliances. (*b*) The minimum pressure required for operating the appliances. (*c*) The re-adjustment of different types of appliances.

7. Discuss recent developments in the design of gas-cookers, under the headings of: (1) Thermal efficiency. (2) Maintenance. (3) Convenience and appearance. In what respect are opinions divided with regard to the type of boiling burner that should be adopted and the construction and ventilation of the oven? Give your views on these points, and your reasons for holding them.

8. On the drawing attached, which represents a small house of two storeys, will be found indicated the positions of a sink in the scullery, and a bath and a hand basin on the first floor. Describe in specification form the hot-water system you would recommend, and show clearly



on the drawing the lay-out of the pipes and the position of boiler, hot-water storage (if any), &c. Say how your recommendation would be modified if you had also to provide for heating an airing cupboard on the first floor and a hot-water radiator in the hall.

9. Sketch a gas-heated crucible furnace for metal melting, and describe its essential features. Also describe lighting up, heating, and working the apparatus. Give your estimate of the number of therms required per 100 lbs. of scrap brass castings (60 p.ct. copper, 40 p.ct. zinc) melted (*a*) for first melt from cold, (*b*) for subsequent melts, specifying the size and type of crucible furnace to which your answer refers. How would you explain the advantages of a gas-heated furnace over a similar furnace heated by solid fuel?

10. Compare the relative cost of gas (low-pressure) and electricity in respect of the installation, maintenance, and running of 500 c.p. outside shop lamps, giving the figures on which the comparison is based. Take gas at 8d. per therm and electricity at 4d. per B.O.T. unit. Discuss and express an opinion on the recent recommendations of the Home Office Departmental Committee on Lighting in Factories and Workshops.

The fortieth anniversary of the Junior Institution of Engineers was celebrated on the 6th inst. by a dinner at the Café Monico. Sir J. Fortescue Flannery, Bart., the President of the Institution, was in the chair, and in replying to a toast impressed upon men who desired to attain success that they must have a speciality.

NATIONAL GAS COUNCIL DISTRICT EXECUTIVE BOARD MEETINGS.

South-Western Area.

The Annual Meeting was held at the offices of the Exeter Gas Light and Coke Company on May 15—Mr. G. Hardy Harris (Chairman) presiding.

The minutes of the last annual meeting, dated May 16, 1923, and also of the last meeting of the District Executive Board, dated Nov. 15, 1923, were read and confirmed.

The Chairman read and moved the adoption of the report of the Management Committee for the year ended March 31, 1924. Mr. P. S. Hoyte seconded, and the report was adopted.

The list of elected members for the District was received.

On the motion of Mr. J. H. Ellis (Plymouth), seconded by Mr. J. E. Norman (Weston-super-Mare), it was resolved that Mr. G. Hardy Harris (Exeter) be re-elected Chairman of the District Executive Board for the ensuing year. Mr. G. Hardy Harris proposed, and Mr. C. G. Dawson (Torquay and Paignton) seconded, and it was agreed, that Mr. P. S. Hoyte (Plymouth) be re-elected Vice-Chairman for the ensuing year.

The following twelve members were elected on the Management Committee: Messrs. J. Armstrong (Ilfracombe), R. Bruford (Taunton), J. H. Cornish (Bridgwater), C. G. Dawson (Torquay and Paignton), W. E. Dean (Exmouth), S. E. Hailiwell (Bristol), S. J. Ingram (Truro), J. E. Norman (Weston-super-Mare), W. P. Tervet (Devonport), W. N. Westlake (Exeter), J. Wesley Whimster (Bath), and T. H. Woodcock (Stroud).

On the motion of Mr. C. G. Dawson, seconded by Mr. J. Armstrong (Ilfracombe), it was resolved that Mr. E. H. Dart be re-elected Hon. Secretary for the ensuing year.

It was proposed by the Chairman, seconded by Mr. J. E. Norman (Weston), and carried unanimously, that Mr. J. H. Ellis, who retires and is eligible for re-election, be re-elected as one of the representatives on the Central Executive Board.

A letter dated Feb. 18, 1924, from Mr. E. J. Fottrell (Joint Manager of the National Gas Council) was read, and the attention of members present drawn to the correct procedure in regard to the lodging of appeals against an adverse report by a Gas Examiner.

Midland District.

The Annual Meeting of the Midland District Executive Board took place in the Grand Hotel, Birmingham, on Thursday last—Mr. James Paterson in the chair.

The minutes of the last annual meeting having been taken as read, the annual report, which had been previously circulated to the members, was presented by the Chairman, who made special reference to several of the matters mentioned therein. Alderman T. Mitchell proposed the adoption of the report, which was seconded by Mr. F. C. Briggs and carried unanimously.

The Chairman proposed that Mr. P. N. Langford, of Coventry, who has acted as Vice-Chairman during the past eighteen months be appointed Chairman for the ensuing year. This was seconded by Mr. H. A. Thomas, of Cheltenham, who in doing so made feeling reference to the work of the retiring Chairman (Mr. J. Paterson), and his own personal appreciation of the valuable services rendered by Mr. Paterson to the Cheltenham Gas Company, and to the industry generally. He expressed deep regret at the severance of Mr. Paterson's connection with the Cheltenham Gas Company, and his sincere good wishes for Mr. Paterson's future success. The nomination of Mr. Langford was further supported by Alderman T. Mitchell, and carried unanimously. Mr. Langford, in reply, thanked the meeting for electing him, and fully endorsed the sentiments expressed regarding the retiring Chairman.

Mr. A. W. Smith proposed that Mr. L. E. Clift be elected Vice-Chairman for the ensuing year. This was seconded by Mr. R. J. Milbourne, and carried unanimously. Mr. F. C. Briggs proposed that the present Management Committee be re-elected *en bloc*, with the addition of Mr. W. E. Caton, of Oxford, in place of Mr. L. E. Clift, elected Vice-Chairman. This was seconded by Mr. T. Poulson, of Stafford, and carried unanimously. Mr. Paterson proposed that Mr. H. Davies (retiring by rotation) be re-elected Representative of the District upon the Central Executive Board. This was seconded by Mr. A. W. Smith, and agreed to. Mr. L. E. Clift proposed that Mr. P. N. Langford be elected as Representative upon the Central Executive Board in place of Mr. J. Paterson, who ceases to be a Member of the Council. This was seconded by Mr. R. J. Milbourne, and carried. Mr. Paterson proposed that Mr. C. M. D. Belton be re-appointed Secretary of the District Executive Board. This was seconded by Mr. H. A. Thomas, and carried unanimously.

Mr. F. C. Briggs, in moving a vote of thanks to Mr. J. Paterson for his services as Chairman, expressed great regret at the circumstances causing the break in his association with members of the National Gas Council, and wished him every success in his future career. This was seconded by Mr. J. Ferguson Bell.

Erratum: Eastern Counties Report.—We regret that an error appeared, on p. 466 of last week's issue, in our report of Mr. R. G. Shadbolt's observations on Messrs. Grout's works. The latter firm's employees number as many as those of a gas undertaking producing "2000 million c.ft. a year," *not* as reported.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to the Nechells Works of the Birmingham Corporation Gas Department.

In spite of the inclement weather, about thirty-five members of the Midland Junior Gas Association paid a visit on Saturday, May 10, to the Nechells Works of the City of Birmingham Gas Department.

The visitors were received by Mr. E. B. Tomlinson (Works Engineer) and Mr. L. H. Thomas (President of the Association), who is engaged at Nechells, and were conducted over the works; the guides, in addition to Mr. Tomlinson himself, being Messrs. W. C. Pinkney, E. Arthur, and F. J. Bengough.

NECHELLS GAS-WORKS.

Of all the works of the Department those at Nechells are the most recently built, and within the last two years have been brought up-to-date by the replacement of the old inclined installation by continuous vertical retorts. Originally a part of the Saltley Station, Nechells first became a separate works in 1900. The first structure erected on the site was a gasholder, in 1881. The works cover an area of about 24½ acres, and are divided from Saltley Works by the Midland Railway. The coal storage capacity is 50,000 tons, and coke storage 10,000 tons. The works have a daily capacity of 14,500,000 c.ft. of coal gas, and 6,000,000 c.ft. of water gas. The normal maximum consumption of coal during the winter months is 1190 tons per day, and during the busy season of the year employment is found for 630 persons.

CARBONIZING PLANT.

There are two retort-houses, 320 ft. long by 115 ft. wide, situated at the north end of the works. No. 1 was originally designed for an installation of inclined retorts of 5,000,000 c.ft. per day capacity. It is now equipped with a modern installation of four benches of Woodall-Duckham continuous vertical retorts, two benches having 32 retorts each, and the other two 28 retorts each. Each retort has a daily capacity of 7 tons of coal, so that the capacity of the house is 840 tons per day, producing 10,500,000 c.ft. of gas. The retorts are fitted with mechanically-operated continuous extractors. There are four producers at the ends of each bench. Combustion of the producer gases takes place round the outside of the retort walls, the flames passing downwards. The waste gases then rise through recuperative tubes, heating up the air required for the above-mentioned combustion of the producer gases, and are then drawn by electrically-driven fans through waste-heat boilers before passing to the chimneys. There is one boiler per bench of retorts, and each is capable of raising over 7000 lbs. of steam per hour at 120 lbs. per sq. in. pressure; no extra fuel being used. The steam is used for supplying the retorts, for driving the air compressor for raising water, and for operating pumps and engines at various parts of the works. The waste-heat boilers are connected to the boiler section at the water-gas plant by a 5-in. main, and from there by a 4-in. main to the boilers supplying steam to the exhauster house.

In the centre of No. 1 retort-house are six ammoniacal liquor coolers and two tar and liquor separators. The tar and liquor from the retort tar pots flow through the separators, the tar passing away to the wells, and the liquor travelling through the coolers before being pumped round for spraying in the crude-gas mains to cool and wash the gas. No. 2 retort-house contains 32 regenerative settings of eight horizontal retorts, a total of 256 retorts. This plant has a productive capacity of 4,000,000 c.ft. per day from about 350 tons of coal. These retorts are charged and discharged simultaneously by Fiddes-Aldridge stoking machines.

COAL-HANDLING PLANT.

The coal required for carbonization is handled by methods which are almost unique. The trucks are pulled one at a time on to the cradle of a "Mitchell" hoist and tipped by means of electric capstans, and are then raised to about 31 ft. and automatically tipped sideways into the coal-receiving hopper, the truck being held on the cradle by means of a lattice bolster and wire ropes connected to balance weights. This plant is in duplicate, and each section is capable of elevating, emptying, and lowering each truck in about four minutes; the whole of these operations requiring only the pushing of a button. From the receiving hopper the coal is next fed by an adjustable jigger feed into coal breakers of 100 tons per hour capacity, underneath which the coal is received by one of two gravity bucket elevators, each capable of handling 100 tons per hour. From the elevators the coal is placed into tipping tray conveyors, one for every two retort benches, which distribute the material in the hoppers, depositing it where necessary by means of travelling dumpers. Each tipping tray conveyor can deliver 100 tons per hour. The coal from this plant may be screened, the large material passing to the tipping tray conveyors for the vertical-retort installation, the fine coal being carried by means of a belt conveyor to No. 2 retort-house for use on the horizontal retorts. This fine coal is automatically weighed, while being conveyed on the belt, by a "Blake Denison" automatic weighing machine. The plant for supplying the horizontal retort house with coal is now only used in emergencies. It consists of two 50-tons per hour crushers, elevators, and conveyors which feed the overhead hoppers.

COKE HANDLING AND SCREENING PLANT.

On the vertical-retort installation the coke is discharged every two hours from water-sealed doors under the retorts into 3-ton skips which run on electrically-driven chassis. When full of coke, these travel to the south end of the retort-house, and the skips are there hoisted by electrically-driven traversers to a height of 43 ft., and are then transported either to the fuel hopper, to the coke-screening plant, or to the stock yard. The skips are automatically discharged. In connection with the horizontal-retort installation, the coke is discharged from the retorts on to hot-coke conveyors, which deliver the coke after quenching into ferro-concrete hoppers. Thence it is conveyed in skips to the screening plant or to the stock yard by 2½-ton telphers, the skips being automatically filled from the ferro-concrete hoppers. The telpher skip opens by its own weight a mechanically-operated door in the hopper, and the weight of the full skip automatically closes the door. The screening plant for the vertical installation is a ferro-concrete structure with hoppers for receiving the coke from the skips. From these hoppers the coke passes through one of two rotary screens, from which the large coke slides down spiral shoots, to prevent breakage, into hoppers underneath. The rest of the coke—small coke, breeze, &c.—is taken by means of a belt conveyor to rotary screens, where it is graded according to size. The small coke, breeze, and dust fall down shoots into separate hoppers, from which the material is bagged or loaded into trucks or carts. Any size of coke, or all the coke, may be removed by means of a belt conveyor to the stock yard, instead of being fed into the hoppers. There are two screening plants for dealing with the coke from the horizontal plant, one for town trade and one for truck trade. The town-trade screening plant is situated at the south end of No. 2 retort-house, and the truck-trade plant is erected over the railway lines at the east side of the same house. To each of these plants the coke is conveyed by overhead electric telphers, and dumped into receiving hoppers. Each plant has one rotary screen, and the various sizes of coke are fed into hoppers under the screens. From these it is bagged or fed into carts, in the case of the town screen, and loaded into trucks from the truck screen. The telphers can carry coke from the horizontal retorts to the stock yard when required.

CONDENSING PLANT.

In the vertical retort house the gas is conveyed by two 30-in. foul mains which join into a 42 in. vertical main, and from there it passes through two "Cyclone" tar extractors, each of 6,000,000 c.ft. per day capacity, which remove heavy tar. The gas, still in two streams, then passes through atmospheric condensers, each consisting of seventy-two 9-in. cast-iron pipes with a total length of 60 ft. each. Following these, the gas passes through two "Atlas" cross-tube water condensers, which are 42 ft. 9 in. high and 8 ft. by 6 ft. 8 in. section, and contain 1008 3¼-in. external diameter steel tubes, and from these it passes through vertical water-cooled condensers. From the condensers, the water flows to the overhead storage tank, from which it is used for coke quenching, &c. The gas from the horizontal retort house is conveyed by two 30-in. foul mains to two sets of air condensers, exactly similar to the above, and then through water-cooled condensers.

EXHAUSTERS AND TAR EXTRACTORS.

There are two British Thomson-Houston turbine-driven exhausters, each capable of dealing with 600,000 c.ft. of gas per hour. The turbines are of the Curtis type, running at 2750 r.p.m., and are direct-coupled to the exhausters on one bed-plate. There are three Livesey tar extractors, each with a capacity of 5,000,000 c.ft. of gas per day. The gas then passes to four Kirkham, Hulett, and Chandler washer-scrubbers, fitted with Holmes patent brushes. Following these, the gas passes through two Davidson and Liversedge vertical washers or one Feld vertical centrifugal spray washer. The Davidson and Liversedge washers are each capable of passing 6,000,000 c.ft. of gas per day, and the Feld washer 5,000,000 c.ft.

For the removal of sulphuretted hydrogen by absorption with hydrated oxide of iron, 24 rectangular cast-iron purifying boxes have been installed. Each box is 40 ft. long by 35 ft. wide by 6 ft. deep. The purifiers are housed in two sheds, floors for the revivifying of the spent or partially spent oxide being over the boxes. The covers of the boxes are raised by internal rams worked by hydraulic pressure. The sheds are served by two railway docks and two hydraulic wagon lifts. The revivifying floors have suitable tracks for the movement of two hydraulic cranes, complete with grabs for lifting oxide when it is thrown out from the purifiers.

The naphthalene and benzole extraction plant consists of two vertical centrifugal spray washers. The plant is capable of dealing with 12 million c.ft. of gas per day, and the circulation of oil in the washers is 9000 gallons per hour. The crude benzole recovered in the distilling plant approximates 1000 gallons per day. There are also two fractionating stills and an acid-washing plant at Nechells, by means of which the crude benzole can be rectified and washed with sulphuric acid and caustic soda, in the production of refined motor spirit.

BOOSTERS.

There are two boosters, each consisting of a single-stage Rateau fan, driven by a 70 B.H.P. Curtis condensing steam-turbine, direct-coupled. They are capable of passing 700,000 c.ft.

of gas per hour each, and are used for the purpose of relieving the pressure on the purifiers.

The meter house adjoins the exhauster house, and contains three meters by Messrs. Parkinson and W. & B. Cowan, Ltd. Each is capable of passing 250,000 c.ft. of gas per hour.

Steam Generating Plant.

In addition to the steam-generating plant previously mentioned for raising steam from the waste heat of the Woodall-Duckham vertical retorts, there are two Lancashire boilers, 28 ft. long by 8 ft. in diameter, fitted with forced-draught furnaces; two Lancashire boilers, 30 ft. long by 8 ft. 6 in. diameter, with Crosthwaite's forced-draught furnaces, and two Babcock and Wilcox boilers. The Babcock boilers are specially designed for burning coke dust. The coke dust is raised to overhead hoppers by means of a grab, which is elevated from the underground pit by means of a telpher capable of handling 16 tons of fuel per hour. The ashes from the boilers are delivered into skips which are electrically hoisted up an inclined track and discharged into an overhead hopper, from which they are removed to the tip.

Water-Gas Plant.

This plant consists of six sets of Humphreys and Glasgow machines, with a total nominal capacity of 6,000,000 c.ft. of gas per day. Four of the sets are capable of producing either carburetted or blue water gas, and the other two sets are designed for blue water gas only. Air blast at 20 in. water pressure is supplied to the machines by two blowers, driven by 75 H.P. turbines running at 1250 r.p.m. Each blower is provided with an automatic safety gate. The gas oil for carburetting is stored in four steel tanks, 60 ft. diameter by 25 ft. high, each of a capacity of 440,000 gallons, built in brick pits. The coke required for water-gas manufacture is raised from an underground hopper by a bucket elevator, and distributed along hoppers over the machines by a tipping tray conveyor. A hydraulic lift raises bogies of coke to the generator stage in case of breakdown to the elevator or conveyor.

Gasholders.

The gas storage consists of two holders, one 197 ft. 6 in. diameter and 144 ft. high, capable of holding 4,000,000 c.ft., and the other 261 ft. diameter and 168 ft. high, capable of storing 8¼ million c.ft. The gas made at Saltley is passed on to the town through Nechells Works, and for this purpose the two stations are connected by a 48-in. main.

Following the inspection, tea was provided, at the conclusion of which the President proposed a hearty vote of thanks to the Gas Committee for their hospitality, coupling with the vote the names of Mr. Tomlinson and the guides, who had done their utmost to make the visit an enjoyable one.

Mr. Adlington (Worcester) seconded the vote, and acknowledged the trouble the guides had taken to make everything as clear as possible to the visitors. As a country member he was impressed by the hugeness of the undertaking.

Mr. Tomlinson said that, on behalf of the Gas Committee, he would convey the hearty vote of thanks to the Committee. Mr. J. Foster, Engineer-in-Chief, had intended to be present, but had been prevented at the last moment. The Gas Committee were always pleased to be of assistance to the Association—they felt they had some responsibility in educational matters, as they were in charge of such a large undertaking. He and his assistants always found the works of interest. Speaking of the vertical house, Mr. Tomlinson said that many visiting engineers—particularly American—had expressed their admiration of its general layout. Owing to the fact that the Birmingham geological fault ran through the works, rendering the ground insecure, it had not been possible to instal coal crushers underground, and this accounted for the Mitchell coal hoist which they had all seen.

Desk Calorific Value Indicator.

A new distance calorific value indicator which has been introduced in the United States by the Cutler-Hammer Manufacturing Company, of Milwaukee, for use in connection with the Thomas recording calorimeter, is described in the "Gas Age-Record." It is for placing on the desk of the manager or plant superintendent, and shows at a glance, by green, white, or red lights, whether the B.Th.U. requirements are at the moment being met. Operated from the Thomas calorimeter, the white light indicates that the gas quality is of the desired standard or not more than 5 B.Th.U. higher. Should it be 6 to 10 B.Th.U. above the standard, the white and green lights show together; and if it is over this limit, the green light shows alone. On the other hand, should the calorific value be below the standard, the white and red lights show together; and if it is more than 5 B.Th.U. below the standard, the red light appears alone. A clock set in the indicator is an aid in noting the times of irregularities.

North of England Gas Managers' Association (Auxiliary Meeting).—Next Saturday afternoon (May 24), at 2 o'clock, there will take place, in the workshops of the Distribution Department of the Newcastle and Gateshead Gas Company, Market Street, Newcastle-on-Tyne, the tenth half-yearly auxiliary meeting of the North of England Gas Managers' Association. The chair is to be taken by Mr. William Batt, Jun., who will deliver an address, after which there will be an inspection of the workshops of the Distribution Department.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

The Association held their second Annual General Meeting on Saturday, May 3, at the Gas Offices, Newport (Mon.), under the chairmanship of the President, Mr. T. A. Canning.

Mr. J. H. Canning, O.B.E., Engineer and Manager, welcomed the members, and said that he had a congenial task in expressing the pleasure that his Directors and he himself had in inviting the Association to meet at Newport. He remembered the time when it was not usual for men engaged in the industry to be gathered together for discussion, but he assured them that he was impressed by the useful work done in this district by the Junior Association. In his experience, he had seen the development of many phases of the industry, and many interesting periods had been covered during his recollection. Commencing from the time when there was no competition, and when flat-flame burners were universal on the district and in the works, and when regenerative furnaces were unknown, he well remembered seeing the first furnace with an outside generator. Since that time they had had vast improvements, including the vertical retorts and all the ramifications of sales organization. The improvements in the works, and the efficiency on the sales side, had become universal. Probably many of those listening to him would in the future guide the destinies of gas undertakings, and he hoped that full advantage would be taken of the information they were able to gather from time to time through the Association by their meetings and visits.

The Hon. Secretary, Mr. B. J. Bell (Cardiff), in rising to move a vote of thanks, said that the Junior Association were indebted for the kind reception they received in the district. No one had been more anxious to promote their welfare than Mr. J. H. Canning. Without the interest of the engineers and managers, the work would have been impossible; but with their help and encouragement, no difficulty had been experienced, and the result was that the Association had become a force in the industry. No doubt the gas authorities would reap the benefit in the future. No words were adequate to convey the indebtedness of members for the facilities offered. He was sure that Mr. Canning would accept the thanks of the Association and the personal thanks of the members for his efforts on their behalf.

Mr. T. B. Armitage (Swansea) fully endorsed the Secretary's remarks, and said that he had experienced the great advantages which had been offered from time to time by the various undertakings through the good offices of the engineers and managers. He hoped that the members would show the appreciation which was due to Mr. Canning.

The vote of thanks was most heartily passed.

On the unanimous recommendation of the Council, with the solid support of members, Mr. George Clarry, F.C.I.S. (until recently General Manager and Secretary of the Cardiff Gas Light and Coke Company), was elected first Patron of the Association. The resolution passed was as follows:

> "That Mr. George Clarry, F.C.I.S., be appointed first Patron of the Wales and Monmouthshire Junior Gas Association, as a mark of appreciation for the keen interest he took in the formation of the Association, and the assistance granted during the course of its activities."

Mr. T. Noall then presented the financial report, and explained that at the moment the funds of the Association showed a small deficit. The Council, however, had the matter in hand, and this state of affairs would be altered.

The Hon. Secretary submitted the Annual Report.

Annual Report.

Your Council have pleasure in presenting the annual report, which terminates the second session of your Association's work. The interest of members has been marked by considerable enthusiasm, which has maintained the attendance at the meetings, promoted useful discussions, and proved the utility of your organization as a means of consolidating knowledge and experience.

The address with which your President opened the session was a contribution for which the thanks of the Association are due to Mr. T. A. Canning, who during his term of office has so ably led the meetings and set an encouraging example by his assiduous attendance at meetings and visits.

We are indebted to the gentlemen who have kindly given lectures and papers during the session—viz., Messrs. J. W. Lofts (London), E. W. Smith, D.Sc., F.I.C., H. W. Webb, M.Sc., and A. C. Prankard. It is particularly gratifying that the first three named gave your Association the benefit of their wide experience; and your Council wish to place on record their thanks to them, and also to our own members who have assisted by contributing papers and taking part in debates.

Three successful visits have been made during the session, including the Mannesmann Tube Works, Newport, the Albion Collieries, Cilfynydd, and the Gas-Works, Neath. The facilities offered on these occasions were greatly appreciated, and thanks duly tendered for the privilege.

Membership.

The membership of the Association at present stands at 114; but in this connection, in view of the Treasurer's report, your Council are giving this matter attention, as they feel that some members are not fulfilling their obligations. It is hoped that it may be possible to adjust this during the coming session.

Retirements.

Messrs. G. Hughes (Chepstow) and D. M. John (Aberdare), who

have rendered efficient service and great help as members of the Council, retire this year; and the appreciation of their services is placed on record.

EDUCATIONAL COURSES.

The matter of education has long been under consideration among the Junior Associations, and the opportunity is taken to remind members that the Institution of Gas Engineers have adopted a scheme of examination which will meet the needs of those who desire a complete training in the industry. At the Joint Meeting of the British Gas Associations held last November, arrangements were made so that the two members representing the Junior Associations on the Advisory Committee could supply any information which members might require. Particulars regarding centres of education and instruction where subjects to be studied will be held, or any other details, will be supplied by your Secretary. As an Association, the Council trust that South Wales Juniors may be well represented in the examination lists.

ADVANCEMENT.

Suggestions with regard to the activities of your Association will be appreciated by the Council, and the names of members willing to give papers at the meetings will be welcomed. It is desired to call attention to the fact that, as we are about to embark upon the third session, continued interest and support is vitally necessary if the Association is to continue to be of valuable assistance to the industry; and individual members are asked to support the meetings and visits which will be arranged. The Council hope that there will be no lack of interest on the part of the members; and every effort will be made to make our organization a still greater force for the development of the industry generally, and in our own district in particular.

The PRESIDENT announced that the following officers had been elected:

President.—Mr. B. J. Bell (Cardiff).
Senior Vice-President.—Mr. J. Wood (Rhondda).
Junior Vice-President.—Mr. H. T. Lewis (Abertillery).
Hon. Treasurer.—Mr. R. J. Auckland (Cardiff).
Hon. Secretary.—Mr. D. E. Crowley (Newport).

In order to fill vacancies on the Council, the following members were elected by ballot: Messrs. R. L. Aspinall (Barry), A. R. Martin (Merthyr), and J. A. Cuniffe (Swansea).

At the conclusion of the business meeting, the members inspected the new gasholder which has recently been erected at Newport, and were afterwards entertained to refreshments by invitation of the Directors of the Newport Gas Company.

Heat Balance of a Gas Enamelling Furnace.

Mr. Lawrence E. Biemiller, of the Consolidated Gas, Electric Light, and Power Company of Baltimore, has contributed to the "Gas Age-Record" actual operating figures of the heat balance of a gas-fired enamelling furnace, which has been at work in his city for several years, treating steel and cast-iron goods. It is a direct-fired continuous-type open furnace—*i.e.*, it operates continuously with a practically constant demand for gas. Operating on miscellaneous small cast-iron ware, the following results were obtained: Ware enamelled in November, 298,035 lbs. (gas used, 1,013,000 c.ft.); December, 293,054 lbs. (gas used, 1,011,000 c.ft.). All the ware was heated once from 50° to 1600° Fahr. Half was reheated twice from 1000° to 1500° Fahr., and half was reheated once from 1000° to 1500° Fahr. With ware going through according to this cycle, the average daily heat balance becomes:

Item.	B.Th.U.	P.Ct.
1.—Heat put into enamelled ware	5,080,000	27·1
2.—Radiation loss	4,560,000	24·4
3.—Loss in flue gas, due to heat put into ware, and lost as radiation	7,510,000	40·0
4.—Unaccounted-for losses	1,600,000	8·5
Total	18,750,000	100·0

Before this furnace was built to operate on gas, the work was done in a coal-fired oven of about the same size. As soon as the gas-furnace was put into operation, there was a noticeable increase in production. Now, after the furnace has been in use for two years, the Enamelling Company estimate their production to be 42 p.ct. greater than it was with the coal-fired furnace. In addition, there is less rejected ware, the working conditions are cleaner and more pleasant, and production is more regular and of higher quality. Production with coal and gas fired enamelling furnaces comes out as follows: Coal-fired furnace, 8075 lbs. of ware per day; gas-fired furnace, 11,480 lbs. of ware per day.

Study of Coking Coals.—Mr. Harold J. Rose, in a paper read before the American Chemical Society (Gas and Fuel Section), gives the ultimate analyses of 600 coking coals plotted on the basis of carbon *plus* hydrogen *plus* oxygen equals 100 p.ct. The Parr correction for pyrites and water of hydration in ash-forming constituents is used throughout. This chart, when employed in connection with certain other tests of coal, has proved of considerable value in predicting coke quality and the bye-product yields obtainable. It is said to be a most promising method for studying the very complex relations between the composition of a coal and its value for bye-product coking purposes.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Staffing the Gas Exhibit.

SIR,—Many engineers attending the conference at Wembley last week visited the Gas Exhibit for the first time; and it will be gratifying to those undertakings who contributed so readily and liberally to its support to know that an extremely favourable impression was created by the dignified and restful treatment of the section, and by the complete and very attractive display of gas appliances, and that it is arousing widespread interest among the general public, judging from the number of visitors and inquiries respecting the applications of gas.

These receive the attention of the large and experienced staff which it is desirable should be fully maintained throughout the period of the Exhibition; and I should like to suggest to those undertakings who have not already done so that they communicate with the Exhibit Committee, at No. 30, Grosvenor Gardens, offering the services of a member or members of their staff for such times as are convenient.

Their attendance would emphasize the co-operative character of the Exhibit, create a link between the undertaking and any of their customers who may visit the Exhibition during the same period, and incidentally afford an invaluable opportunity for wider experience.

Gas Offices, Preston,
May 15, 1924.

SAMUEL TAGG, President,
Institution of Gas Engineers.

REGISTER OF PATENTS.

Coke Cooling.—No. 201,551.

SULZER BROS., LTD., of Winterthur.

No. 18,896; July 23, 1923.
Convention date; July 29, 1922.

This invention relates to coke-cooling apparatus of the general design of that illustrated on p. 155 of the "JOURNAL" for Jan. 16 last. It was found that a tendency existed for the core of the coke charge to travel more rapidly than the rest to the lower hopper for discharge; and a baffle in the form of cross ties was tried, to prevent this. It was then found, however, that the flow of cooling air was interfered with, and became no longer uniformly distributed.

The patentees claim to overcome this objection by the present invention, which provides for air also to be blown to the coke through apertures in the bridge member itself; these apertures being provided with protective hoods.

Heat-Control in Water-Gas Making.—No. 213,818.

HUMPHREYS AND GLASGOW, LTD., of Victoria Street, S.W. 1.
(A communication from O. B. EVANS, of Philadelphia.)

No. 17,269; July 3, 1923.

The objects of this invention are to secure better temperature control in water-gas making, to avoid waste of gas-making materials, to improve the quality of gas, and to provide means for enabling these objects to be readily attained.

According to the invention, each individual step, run or blow, is varied in length and terminated when predetermined temperature has been reached, in contradistinction to the old practice of seeking to attain the predetermined cyclic temperature by the average of the repetition of a number of adjusted steps, "which imperfectly and at best approximately accomplished that end, and during temporary departures from the correct cyclic temperature resulted in waste of gas-making materials and poor quality of gas."

The objects are achieved by (quoting a claim) "the combination of automatic run and blast mechanism, a limit stop for said mechanism adapted to continue the run or blast, and thermally responsive provisions adapted to start said mechanism and interrupt the blast or run or to permit said mechanism to remain at rest and continue the blast or run, according to the temperature produced in the blow or run." The control originates from a thermocouple in the superheater.

Prepayment Mechanism.—No. 214,077.

DOUGALL, J., of Chiswick, W. 4.

No. 9354; April 5, 1923.

The patentee refers to prepayment mechanism in which a coin carrier serves to transmit motion in one direction from an operating handle to a toothed wheel (through a pawl) which by suitable gearing effects longitudinal movement of a screwed measuring spindle which, in turn, operates mechanism for opening a valve in the gas passage. He describes briefly the closure mechanism, the price-changing device, and the indicator, and points out that "the present invention consists in a prepayment mechanism of the type above described, including the following features: A pivoted lever or finger for locking a price-changing plate, a bayonet locked ring serving to retain the price-changing plate, and locked, together with said plate, by means of said pivoted lever or finger, which is locked by a sealed part of the meter cover."

Retort Charger.—No. 213,956.

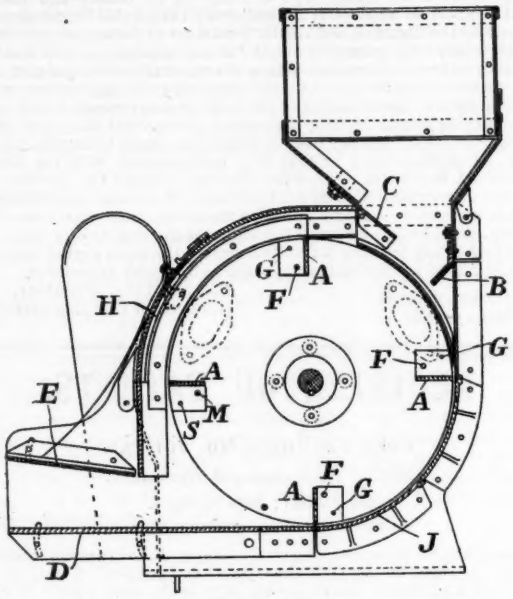
DRAKES, LTD., and DRAKE, J. W., both of Halifax

No. 399; Jan. 5, 1923.

This invention relates to retort-charging apparatus of the well-known rotary projector type; and the modifications claimed enable the

quantity and the direction of the charge to be controlled, and result in the minimum of propelled air, the avoidance of serious breakages, and the easy substitution of worn parts.

The side discs of the projection, which is mounted on a driving shaft, carry blades A fixed near their peripheries. A baffle B deflects the coal and directs it between the central driving shaft and the inner edges of the projector blades A. An adjustable sliding shutter C, actuated by a handle, is arranged to limit the size of the passage leading from the coal shoot to the baffle B, by which means the charge may be controlled.



The Drake Projector.

The base plate D and the roof plate E at the outlet orifice are pivotally mounted for control of the trajectory of the projected coal; while the keeping of the blades A to a smaller depth than that of the outlet orifice ensures that the air propelled is not of sufficient volume to cause any undesirable raising of dust, projecting of flame, &c.

To provide against serious jamming and breakage, the blades A are fixed to the discs by pivotal pins F and weak bolts G; so that in the event of obstruction the bolts G would shear, and allow the blades to swing on the pins F.

H is a hinged door which allows interior repairs to be easily effected; and J is a removable part of the casing which permits of substitution of this part subjected to heavy wear.

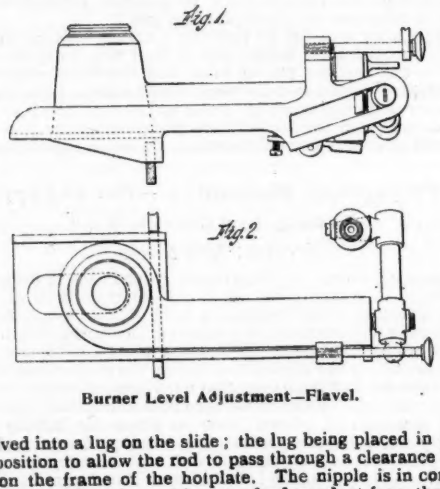
Adjustable Burners for Hotplates.—No. 214,091.

Flavel, P. W., of Leamington.

No. 11,739; May 1, 1923.

This invention has for its object to provide means by which the level of hotplate burner heads can be adjusted.

One form of the invention is illustrated by figs. 1 and 2, a side elevation and plan respectively. The burner rests on a slide operated by a



Burner Level Adjustment—Flavel.

rod received into a lug on the slide; the lug being placed in any convenient position to allow the rod to pass through a clearance hole in a bracket on the frame of the hotplate. The nipple is in connection, through a swivelling plug, with a standard pendant from the tap rail. A tap in the standard controls the gas supply. A spherical headed screw and a lug enter a slot in the slide. At its further end the slide has inclined webs which rest on a cross-bar in combination with the frame of the hotplate. The burner is shown at its highest elevation; but if the rod be pulled outwards, the slide will fall, carrying the burner with it.

Where a burner is sufficiently long to make the angularity due to its movement unimportant, the head of the burner alone may be changed in elevation by the movement of the rod. As the angularity only occurs when the burner is lowered, and this position would as a rule be employed only with a reduced gas supply, the angle is not important.

The noiseless lighting arrangement described in specifications Nos. 202,099 and 202,927 [see "Journal" for Sept. 6, 1923, p. 941] may be fitted on the underside of the burner.

Coin-freed Meter Mechanism.—No. 214,289.

Alder & Mackay, Ltd., of Edinburgh, and the legal representatives of the late Thomas Glover, of Fitzjohn's Avenue, N.W. 3.

No. 31,838; Nov. 21, 1922.

This invention relates to prepayment and price-changing meter mechanism in which a price-changing disc is employed, but one which does not partake of the rotation of the coin pocket.

The object is to provide a modified mechanism to reduce the liability of fraud to a minimum, retaining at the same time a compact type of mechanism which can be contained in a small cylindrical casing so that it can, for example, be substituted for mechanisms of a different type such as those in which the price-changing disc does partake of the rotation of the coin carrier.

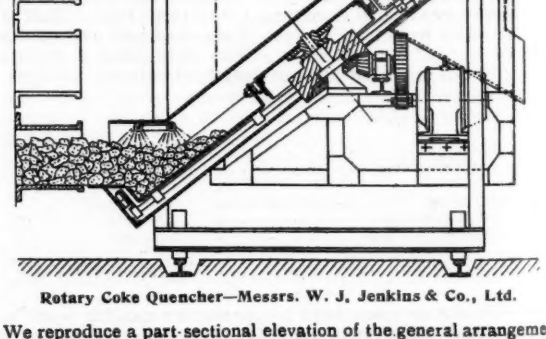
The first claim of the patentees is for "a coin carrier loose on the operating shaft in combination with a pair of cams or projections mounted on the operating shaft and separated by a distance greater than the width of the coin carrier, one cam or projection being adapted to move the coin carrier in one direction and the other cam or projection adapted to move it in the reverse direction, together with a cam ring or the like also mounted on the operating shaft and situated between the coin carrier and the price-changing plate and adapted to force the coin forward in a direction away from the price-changing plate.

Coke Quenching.—No. 214,306.

Williams, R. A., of Newark, and W. J. Jenkins & Co., Ltd., of Retford.

No. 781; Jan. 9, 1923.

This invention, relating to apparatus for quenching hot coke discharged from gas-retorts, &c., comprises an enclosing shell or quenching chamber formed with inlet and discharge openings, and a rotary table composed of a series of independently pivoted elements each capable of receiving a portion of the hot coke through the inlet of the shell and of discharging it through the outlet by a tilting action after the quenching has been effected within the shell. The table preferably revolves about an axis inclined from the vertical, and is arranged to discharge the coke at a higher level than that at which it is received. The table and its enclosing shell are supported on a wheeled frame or carriage by means of which they are moved along the floor of the retort-house or the like in front of the different retorts.



Rotary Coke Quencher—Messrs. W. J. Jenkins & Co., Ltd.

We reproduce a part-sectional elevation of the general arrangement, but have omitted the extension of the telescopic chimney which evacuates the fumes from the quenching. Another drawing with the specification shows that the rotating table may have twelve tilting trays; and an ingenious device for effecting the tilting movement is also illustrated and fully described.

Retort Doors.—No. 214,486.

Broadhead, R. W., and Dempster, R., & Sons, Ltd., both of Elland.

No. 14,447; June 1, 1923.

This invention relates to a self-sealing door that is primarily intended for use with a gas-retort mouthpiece. A door of the kind is pivotally connected with a hinged cross-bar, which is adapted to engage a hinged catch; the opening and closing movement of the door being effected by a lever operating an eccentric, or the like. To tighten the lid against the machined face of the retort mouthpiece, and to open the lid, it is usually necessary to perform three distinct operations: (1) Slacken the eccentric or the like; (2) disengage the catch from the end of the cross bar; and (3) open the lid, or *vice versâ*.

According to this invention, the pivotally mounted catch is so constructed and arranged that, in addition to engaging the cross-bar automatically on the closing of the lid, it is automatically disengaged from the end of the cross bar by the initial opening movement of the

lid, with the result that both the locking and the unlocking operation can be performed by the operator with one hand.

FIG. 1.

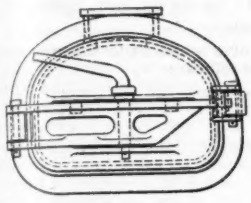


FIG. 2.

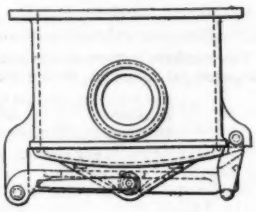


FIG. 3.

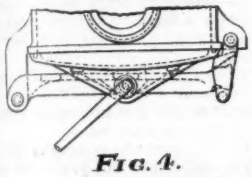


FIG. 5.

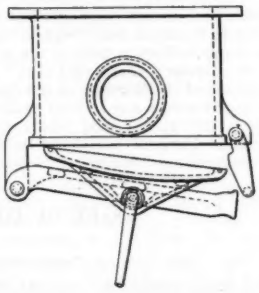
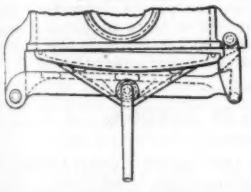


FIG. 4.



Retort Lid—Messrs. Robert Dempster & Sons, Ltd.

Fig. 1 is a front elevation, and fig. 2 a plan of a retort mouthpiece with the lid locked in its closed position. Fig. 3 is a plan of the parts showing the initial movement of the eccentric lever; and fig. 4 is a similar view to fig. 3 showing the commencement of the opening movement of the lid and the catch just clearing the end of the cross-bar. Fig. 5 shows the lid opened further and the catch moved back to its inoperative position. It will be seen from these drawings that the action of the closure mechanism is dependent on the construction of the catch, which is the main feature of the invention; the patentees claiming:

1. A lid or door pivotally connected with a hinged cross-bar that is adapted to engage a catch pivoted on the mouthpiece or other adjacent fixture, characterized by the fact that the said catch is so constructed and arranged that, in addition to engaging the cross-bar automatically on the closing of the lid, it is automatically disengaged from the cross-bar by the initial opening movement of the lid substantially as described.

2. A self-sealing lid or door, according to the preceding claim, wherein the free end of the cross-bar is so shaped as to assist in turning the catch to its holding position and to prevent any possibility of the catch being forced off the end of the cross-bar when the eccentric or other tightening device is being tightened up.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 14.]

Nos. 10,991 to 11,636.

BARRATT, J.—"Apparatus for distilling ammonia liquor, washing gases, &c." No. 11,135.
BERNARD, O. P.—"Lighting installations." No. 11,512.
DOLPHIN, J.—"Gas, &c., burners." No. 11,397.
FORREST, W. A.—"Safety gas-valve." No. 11,165.
GREAVES, W. H.—See Barratt, J. No. 11,135.
HARRISON, J. F.—"Pressure relief valve for gas or air." No. 11,130.
HELPS, G.—"Gas cookers and ovens." No. 11,157.
HOWLETT & CO., LTD., M.—"Gas, &c, burners." No. 11,377.
JONES, A. D.—"Heating-devices using exhaust gases." No. 11,405.
KOPPERS COKE OVEN CO., LTD.—"Vertical retorts for distilling fuel." No. 11,187.
LENCAUCHEZ, J. A.—"Internal distillation of combustibles." No. 10,995.
LEUCHARS, G. M.—"Cases or caps of electric light switches, gas-burners, &c." No. 11,279.
MILNE, J.—"Fluid compressors." No. 11,085.
NEILL, O. S.—"Heat process of manufacturing ferric oxide." No. 11,036.
PARKINSON AND W. & B. COWAN, LTD.—"Vapour lamps, &c." No. 11,618.
PEEBLES, W. C.—See Harrison, J. F. No. 11,130.
PLANTINGA, P.—"Apparatus for operating water-gas sets." No. 11,600.
ROGERS, A.—"Gas fire heating arrangements." No. 11,119.
SANFORD, G. C.—"Gas-cookers." No. 11,392.
SEARS, S. A.—"Gas-burners." No. 11,250.
STIRRAT, J.—"Device for cooling and spreading fumes from gas-mantles, paraffin lamps, &c." No. 11,258.
THORP, C. H.—"Joints for lead, &c., pipes." No. 11,096.
TURNER, E., AND TURNER & CO., E.—"Gas-burners." No. 11,153.
WILKINSON, A. E.—"Gas burners for stoves, &c." No. 11,346.
WILKINSON, A. E.—"Ranges for frying fish, &c." No. 11,347.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The Companies Amendment (Co-partnership) Bill has been read a second time, and committed to a Committee of the whole House.

On behalf of the Chester United Gas Company, a petition has been deposited against the Great Western Railway (Additional Powers) Bill.

HOUSE OF COMMONS.

A petition has been deposited on behalf of the Hastings and St. Leonards Gas Company against the Hastings Corporation Bill.

Gas Regulation Act.

In the House on Monday of last week, drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act were approved, on the motion of Mr. Albert Alexander. The applications related to the Birstall Urban District Council, Mansfield Corporation (subject to the omission of the word "section" in line 4 of paragraph (1) of clause 31, and the insertion in place thereof of the words "sections 4 and"), Marple Urban District Council (subject to the modification proposed by the Select Committee), the Newbury Corporation, and the Penryn Gas Company, Ltd.

A copy was presented of the Draft of a Special Order proposed to be made by the Board of Trade under section 10 of the Act, on the application of the Poulton-le-Fylde Urban District Council.

Gas Mantles.

Mr. HODGE asked the President of the Board of Trade whether he had received a further application from firms in the gas-mantle trade asking for the appointment of a committee of inquiry under Part II. of the Safeguarding of Industries Act, to investigate the new conditions which have arisen as a result of the establishment of German export trade on a gold mark basis; whether he had now received from the applicants certain supplementary information which he asked them to supply; and whether he proposed to accede to the request for a committee.

Mr. ALEXANDER replied that the answer to the first and second parts of the question was in the affirmative. As to the third part, the statements made were being carefully examined, and he hoped it would be possible to reach a decision at an early date.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following further notices regarding applications to the Board of Trade under the Gas Regulation Act.

Hindley Urban District Council.

The Council having applied for an Order to authorize them to charge on the thermal basis and to fix the maximum price per therm, give notice that a supplemental application has now been made by them that there shall be included in the Order a provision prescribing the minimum pressure at which they shall supply gas, and that such minimum shall be less than that prescribed by section 2 (sub-section 2) of the Act.

SPECIAL ORDERS.

Chertsey Gas Consumers' Company, Ltd.

The Company are to apply for an Order under section 10 to enable them to raise further capital, to make provisions as to dividend, to establish co-partnership, to use scheduled land for gas-works purposes, and to regulate the supply of gas.

Halesowen Gas Company.

A Special Order is to be sought by the Company authorizing them to extend the limits of supply, to use scheduled land for gas-works purposes, and to raise new capital.

Middlesbrough Corporation.

The Corporation are to apply for an Order under section 10 to extend the limits of supply, to enable them to use scheduled lands for gas-works purposes, to borrow further money, and to regulate the supply of gas.

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Chard Corporation.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm. (May 16.)

Grangemouth Corporation.

The Order is in the usual terms, but with no price figure inserted. (May 15.)

Motherwell and Wishaw Corporation.

The Order is in the usual terms, but without any price figure being inserted. (May 12.)

MINERS' WAGES AGREEMENT.

Terms of Settlement.

The Negotiating Sub-Committee of the Miners' Federation and the Mining Association met at General Buildings, Aldwych, last week to discuss the terms of a new wages agreement. The following agreed official statement was made at the close of the proceedings.

At the meeting of the Joint Negotiating Sub-Committee the following proposals were arrived at, and the Executive Committee of the Miners' Federation will recommend their acceptance to a delegate conference to be held in London on the 29th inst.

1. Standard profits shall consist of a sum equal to 15 p.ct. of standard wages, instead of 17 p.ct., as at present.

2. The surplus remaining after the deduction from proceeds of the cost of standard wages, costs other than wages, and standard profits, shall be divided between wages and profits in the proportions of 88 p.ct. to wages and 12 p.ct. to profits, instead of the present proportions of 83 p.ct. to wages and 17 p.ct. to profits. The general minimum percentage on standard wages shall be increased from 20 to 33⅓.

3. In no district shall the wages of any adult able-bodied day-wage workman fall below a figure 40 p.ct. above the standard wages (as defined in Clause 7 of the Wages Agreement dated July 1, 1921) of the lowest-paid class of day-wage workmen in the district. For this purpose the word "district" means each district within an area where the area comprises more than one district, and not the area as a whole.

4. In addition to the provision made in paragraph 3 above for improving the position of the lower-paid classes of day-wage workmen, subsistence wages shall be paid in those areas in which they have been, or may in future be, fixed by the District Board, as provided by Clause 5 of the existing agreement. The amounts of the existing maximum subsistence wages and allowances already fixed by the District Boards shall be increased by one-eighth.

5. There shall be effective recoupment of deficiencies below standard profits, but only one-third of any future surplus available for this purpose in any one ascertainment shall be so applied, and the remaining two-thirds shall be divided between wages and profits in the agreed proportions, any balance of the deficiency being again carried forward.

6. The owners undertake that they will deal in the district with cases of anomalies in the wages of men at or near the level to which the lowest-paid class of workmen will be brought by their proposals.

The Joint Sub-Committee will meet again to-day to consider the remaining details of the proposed new agreement.

GAS STRIKE IN DUBLIN.

Industries and Institutions Affected.

A grave crisis arose in Dublin last week owing to a strike of the Alliance and Dublin Consumers' Gas Company's workers and the consequent cutting-off of the gas supply to the city and suburban and township areas. The question at issue between the Company and the workers had been under negotiation for some time, but efforts at settlement proved abortive. It appeared that a labourer had been promoted to a collectorship, that he had then been called upon by the Company to surrender his membership of the Irish Transport Workers' Union and had refused to do so, and that he was thereupon again reduced to the position of a labourer. His fellow workers objected to the Company's seeking to deprive any member of Union rights, and resented this man's treatment. They declared on the first day of the strike that they would uphold the principle at any hazard, and insist that the man be re-appointed to the collectorship. The Company intimated that they had done everything possible to avoid a conflict, but that the men were unreasonable, and that nothing more could be done to meet their views.

The strike took the public completely by surprise. Very short notice was given that the gas supply would be cut off. The townships of Blackrock, Dalkey, and others, and the more immediate suburbs were the first to suffer, but by the Wednesday morning the city supply ceased. Needless to say, there was great confusion and much hardship in many important industries in which gas is used, and in hospitals and other institutions, hotels, and restaurants; while in the poorer districts the deprivation was keenly felt, especially at night.

The Free State Government, intervening after the strike, appointed Mr. Fred Allen as a Court of Inquiry, in the hope of securing a settlement. The Executive of the Transport Workers' Union then asked the workers to return to work pending the inquiry. This they refused to do, whereupon the Executive announced that the strike was unauthorized by them and had no official recognition, so that they could not appear at the inquiry. The strikers then decided to ask Mr. James Larkin, the well-known Labour agitator, who is not a member of the Union, to act as their leader, and this he accepted. As, however, the position had altered, the terms of reference became nugatory, and the inquiry was not held. Matters remained in this way at the week-end, there being then no sign of any movement towards conciliation or settlement. The strikers were refused strike pay by the Union on Saturday.

It is considered that a full week will elapse after the ultimate settlement before a supply of gas can be given.

Tully Gas Plants, Ltd.—We have received intimation from Tully Gas Plants, Ltd., that, consequent upon their amalgamation with Gas and Fuel Plants, Ltd., the Company have gone into voluntary liquidation. The business will, in future, be carried on by Gas and Fuel Plants, Ltd., who own construction rights for plants for the production of smokeless fuel. The registered offices of Gas and Fuel Plants, Ltd., are 40 43, Norfolk Street, Strand, London, W.C. 2; the telegraphic address is "Damper, Estrand," London, and the telephone numbers are City 4047 and 4048.

SAFEGUARDING OF INDUSTRIES.

A deputation of the workers and employers in the gas-mantle industry was introduced at the House of Commons on Monday, by Sir John Norton Griffiths, D.S.O., M.P., to the Rt. Hon. Sydney Webb, M.P., President of the Board of Trade.

The workers presented the result of a secret ballot taken in some of the principal factories, which was as follows:

For the continuation of the duties . . .	1934
Against.	23
Blank or spoilt papers	10

The deputation explained the present conditions of the industry, and the disastrous results which were already accruing from the decision of the Government to remove Part II. of the Safeguarding of Industries Act in August next. They showed that the wages expended directly and indirectly on making gas-mantles in this country amounted to £400,000 per annum; and while the minimum wage of the women workers here were from 6½d. per hour for a forty-eight hour week, the wages of the German women were 2½d. to 3d. per hour, and they had to work a fifty-four to sixty hour week.

The workers also explained that, since the duty had been imposed, there had been a large increase in the number of workers in the gas-mantle factories, more regular employment, and a reduction of a penny to three-halfpence each in the price of English mantles.

Mr. Sydney Webb said that "he felt the greatest sympathy for the position of the workers in the industry, and would not like to do anything to injure any British industry or the people dependent upon it for a living, but that whatever the views were of himself and the Labour Party it would be impossible to get through the House of Commons any legislation to continue the duties under the Act."

SALE OF COKE IN LONDON.

The Public Control Committee of the London County Council have had under consideration from time to time cases in which the existence of serious short weight in deliveries of coke has been established, but in which they have been advised that no effective legal action was possible under the existing law. The Act governing the sale of coke contains, they say, a requirement to sell by weight, and not by measure; but no penalty is provided for a contravention. Though in recent years several cases of short weight in coke have been considered with a view to legal proceedings, in no instance has such action been found possible. Cases are quoted of short delivery, to show how unsatisfactory is the present state of the law.

That it is quite possible to sell coke upon a fair basis is, the Committee say, proved by the fact that it is sold by the London Gas Companies by weight. The coke is first weighed-up in separate sacks, and then the completed loads are checked over a weighbridge before leaving the gas-works. Coke merchants, on the other hand, usually quote coke to the public "by the chaldron" and "by the sack." Legally the chaldron is a measure of capacity equivalent to 36 bushels. So far as the gas companies are concerned, a chaldron of coke is regarded as 12 sacks of 1 cwt.; but, except in the case of sales by gas companies, sacks frequently do not contain 1 cwt. and, as a matter of fact, are often not large enough to hold that quantity or to contain 3 bushels. In some cases, vendors of coke have been seen to draw coke from a gas-works, and subsequently to divide the coke into a larger number of sacks. From an investigation made in one district, the average capacity of coke dealers' sacks was found to vary from 84 to 90 lbs., instead of 112 lbs.

Some idea of the magnitude of the coke trade in London may be gathered from the fact that the sales of one London Gas Company alone approach a million tons annually. Coke is used largely in factories and institutions, and there is also a considerable sale for domestic use. It has been suggested that an enforcement of sale by weight would lead to an increase in the price charged to the public. As against this, however, it may be pointed out that recently the price of a chaldron quoted by merchants has varied from 6s. to 9s. above that for coke delivered by the gas companies, although the latter have supplied a chaldron to the full weight of 12 cwt.

As a result of the Committee's consideration of the matter, they are of opinion that there is no justification whatever in London for the practice of selling coke otherwise than by imperial quantities. As pointed out above, gas companies find no difficulty in connection with the sale of coke by weight, and this seems to be the fairest and most satisfactory method of sale. It has been suggested that this method of sale is open to the objection that it is likely to lead to coke being watered. This is, of course, possible, as coke is known to be very absorbent; but the risk has probably been exaggerated, and in any case the disadvantages of not selling by weight are far greater.

The conditions under which the sale of coke is carried on at the present time are very unsatisfactory to the public, and the Committee consider that there should be a statutory requirement to sell coke by weight. This could preferably be secured by a simple amendment of the Weights and Measures Act, 1889, bringing coke under the same control as coal. They therefore decided to recommend: (*a*) That in view of the unsatisfactory conditions attaching to the sale of coke in London, the Council is of opinion that legislation should be forthwith initiated by H.M. Government to provide that all coke should be sold by weight. (*b*) That a copy of the foregoing resolution be forwarded to the President of the Board of Trade.

Gas Exhibition at Grimsby.—Last week a highly successful gas exhibition was held in the Drill Hall, Doughty Road, Grimsby. The interest in the exhibition from the housewife's point of view was heightened by cookery demonstrations given each day by Miss Edith Sanderson, whose demonstrations were comprehensive. One of the most interesting stands showed at a glance the difference between a coal-fire and a gas-fire.

GAS-METER TESTING AT PORTSMOUTH.

In his annual report, the Portsmouth Corporation Weights and Measures Inspector mentions that, of 8441 gas-meters tested, 367 were fast, 183 slow, 53 would not work, 7 were leaking, and 29 were rejected for various defects. Complaints were received from 205 consumers, and 75 meters were found correct, 91 were fast to an average extent of 5·7 p.ct., 32 were slow to an average extent of 15·5 p.ct., 5 would not register, and 2 were leaking.

With regard to the testing of gas for calorific value, in all 322 tests were made during the year, and the calorific value never fell to the 6 p.ct. limit or anything like it, in fact the lowest result was less than 3 p.ct. below the declared value, and this low result lasted less than 24 hours. The mean for the year was 452·4 B.Th.U.—2·4 units over the declared value. The figures at each testing place were very close. The mean results at each station were: Arundel Street 452·4, Milton 451·2, and Kingston Cross 450·9 B.Th.U. per c.ft. In addition to the official tests, a number of tests were made upon the actual composition of the gas. These tests were made for the purpose of finding out the percentage of inerts and carbon monoxide. The average amount of the latter compound present during the year was 13·1 p.ct. No trace of sulphuretted hydrogen was found, and the minimum pressure of 2 in. required by the Gas Regulation was always exceeded.

GASHOLDER FIRE AT MELBOURNE.

The North Melbourne storage station of the Metropolitan Gas Company was the scene of an occurrence which caused local alarm on the afternoon of March 21, when sheets of flame from one of the holders threatened great destruction to surrounding property. The fire, which broke out without warning, was in connection with a 3 million c.ft. holder, and as a result of the conflagration about 2 million c.ft. of gas was lost.

Two boiler makers, named Mathieson and Noble, had been at work all the day welding a patch on the side of the holder by means of a "quasi-arc" electrical welding apparatus. Suddenly, when the tool encountered a weak spot in the metal side of the holder, a spark flew out. Before the men, who were working on a swinging scaffold about 50 ft. from the ground, could realize what had happened, there was a roar, and sheets of flame shot through the side of the holder near the spot on which the men were operating. They were nearly blinded by the flash, but cried out a warning to others in the yard. The flames, which gradually grew in intensity, leapt through the hole in the side of the holder. Workmen, who imagined that something terrible might happen if the hole became larger and air mixed with the gas inside the holder, shouted to their comrades on the scaffold to hasten to the ground, and this they did by climbing down one of the girders. A second after they had reached the ground, a large steel plate of the holder, the sides of which were now becoming red-hot, was blown from position by the roaring currents of gas, and through the opening belched flames, which shot straight ahead for a great distance. After three-quarters of an hour of hard work on the part of the fire brigade and officials of the Company, the outbreak was overcome, and the hole in the side of the holder blocked up with red lead and clay.

The gas supply was not affected, as arrangements were immediately made by Mr. J. N. Reeson (the Company's Chief Engineer) for consumers in the area affected to obtain supplies from other districts.

STRATFORD-ON-AVON GAS REPORT.

Alderman Ballance, in moving the adoption of the report of the Gas Committee, at a meeting of the Stratford-on-Avon Town Council last week, said he was glad to inform the members that the undertaking had experienced another successful year; the gross profit amounting to £7968. From this had to be taken for repayment of loan, sinking fund, and interest £4783, leaving a net profit of £3185. During the year there had been two reductions in the price of gas—6d. per 1000 c.ft. on July 1, and 4d. on Jan. 1. More gas had been sold during the year, but the revenue from this source was £2319 less. The members, he said, might be wondering what they proposed to do with the balance of profit, but he assured them it was not necessary to go very far in their search for an outlet for the £3000. They were going to pay-off £2000 from the suspense account, and £1000 would go to the district fund for relief of the rates. As to the future, their coal contracts expired on June 30, and an increase of between £600 and £700 in the cost of the coal seemed inevitable. There would also be diminished receipts from gas sales, owing to the reduction in the price. They hoped, in spite of this, to be able to recommend at an early date a 4d. reduction to ordinary and slot consumers, and a reduction of 3d. per 1000 c.ft. for power. This would make further inroads into their receipts of £1476 from ordinary consumers and £88 from power; and the increased price of coal, at £650, made a total of £2214. There did not seem to be much likelihood in the coming year of making a handsome profit, but the Committee hoped they would have enough to pay-off the remainder of the suspense account. The continued success of the works was largely due to the skilful and careful management of Mr. F. Shewring, both in the manufacturing and the commercial departments; and he was backed-up by a very capable and loyal body of assistants.

Mr. Tyler said that, on looking back over the last three years, he found they had spent £14,097 on repairs and maintenance, which was a big item. They paid heavily in income-tax, and he thought it was outrageous that the Gas Committee should make this tremendous profit out of the unfortunate gas consumers.

Alderman Smith thought they might take something off the price of gas, and eventually moved that they reduce the charge by 6d. per 1000 c.ft., but this was not accepted by the Chairman.

After a little further discussion, the report was adopted.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Ordinary General Meeting of the Association was held last Wednesday, at the Cannon Street Hotel, E.C.—Sir CHARLES J. JESSEL, Bart., in the chair.

The SECRETARY (Mr. F. H. James) read the notice convening the meeting.

THE REGISTER OF PROPRIETORS.

The CHAIRMAN: I now beg to move that the Common Seal be affixed to the Register of Proprietors.

The seal having been affixed,

The CHAIRMAN said: The next thing I have to do is to move—

> That the interim dividend at the rate of 5 p.ct., less tax, paid in respect of the half-year ended June 30, 1923, be hereby confirmed.

The DEPUTY-CHAIRMAN (Col. H. Le Roy-Lewis, C.B., C.M.G., D.S.O.) seconded the motion, which was unanimously agreed to.

The CHAIRMAN then called upon the Secretary to read the Auditors' certificate; and this having been done, it was agreed—

> That the accounts for the year 1923, and the scheme prepared in accordance with the Companies' Clauses Consolidation Act, showing the profit available for the purposes of dividend, which the proprietors have before them in the form of the Profit and Loss Appropriation Account, be taken as read.

THE NET PROFIT.

The CHAIRMAN: Ladies and gentlemen, I propose to-day to pursue the habit of mine of recent years of giving you the history of the Association during the past twelve months, by taking you through the accounts which are before you. I will ask you first of all to turn to the right-hand side of the profit and loss account. You will see there that the net profit from stations amounts to £216,909 14s. 6d., which compares with last year's £214,850 6s. 11d. I must say that when these figures first came before me I was somewhat astonished, and I will tell you why. It was because there was uppermost in my mind what the average rate of the Belgian franc was during the past year—for our profits, translated into sterling, are taken at the average rate during the year. Now, the average rate of the Belgian franc during the year 1923 was 88·66 to the pound, and this compared with 1922 when it was 58·18 to the pound. But there were many compensating advantages that accrued to the Association. In the first place, I must remind you that we do not work in Belgium at a fixed price for gas. We work according to a formula. The price of gas is revised every three months, with two important factors to be borne in mind—first of all, the price of coal; and, secondly, the rate of wages paid to the men, not the salaries of the staff or the pensions paid to our pensioners. I must say, however, that, of course, this question of the change of price would in no way compensate us for the loss that comes about by the depreciation of the franc; and I think I can best illustrate this by giving you some of the figures that applied to our Antwerp station during the month of March in the current year, which is the latest month we have to deal with. In March the franc had depreciated from pre-war times to the extent of 344 p.ct. The price of gas, according to the formula was up by 292 p.ct., our stokers' wages were up by 562 p.ct. (although the cost of living was only up by 422 p.ct.), and the cost of coal was 445 p.ct. up. Of course, I must say, in dealing with the wages paid to our stokers, that some of this increase over the cost of living should be attributed to the fact that these men now work only eight hours a day, instead of eleven hours, according to their pre-war practice, and therefore we have to pay increased wages to make up for the three hours' wages that they otherwise would lose.

FORWARD SALES.

The next thing to the working of the formula for the price of gas that was in our favour was the fact that our Board were so sure that the effect of M. Poincare's policy in the Ruhr would be to make the franc very much depreciate, that we sold francs forward for our stations for all the cost of the English coal that we had to send into Belgium for six months, and this was done at an average of 69·15 frs. to the pound, while if we had waited the average would have been 83·25½. (Applause.) Of course, after that it would have been a very difficult thing to have diagnosed the position, and the Board, I think very rightly, came to the conclusion that they would not sell francs any further forward. There were too many uncertain elements in the position to permit of what might be called a policy of long dated provision, and as we naturally did not wish to be considered speculators in exchange the prevailing habit is only to make currency sales as and when the rate of exchange allows the cost of English coal to compare favourably with the cost of local varieties obtainable in Belgium.

CONVERSION OF ASSETS INTO STERLING.

I should like, while I am talking about the exchange, to touch upon the subject of the rates at which the assets of the Association are converted, because in one of the newspapers I saw this policy of ours questioned—or rather it was questioned as to what policy we pursued. First of all with respect to works and mains, this outlay, if it is in respect of plant purchased in England, is taken into the books at the actual sterling cost. If the plant is purchased by the stations, conversion into sterling is effected at the average rate of exchange ruling during the period when the outlay was incurred. As the bulk of the expenditure was incurred when exchange rates were normal, the equivalent of the currency expended, when converted into sterling at present rates of exchange, would be very much lower than the figure of £3,176,978 5s. shown in the balance-sheet, although against this must be set the enhancement in currency value consequent upon the depreciation in the value of the franc. Moreover, the Association have the sum of £2,510,764 6s. standing to the credit of the amortization account and the renewals fund, and the position can, therefore, be viewed with equanimity, more especially as the Board have not departed from the

policy of providing for the reinstatement of capital invested in works and mains by the date of the expiration of the individual leasehold concessions. Freehold land and property abroad have been converted at the rates ruling at the time of purchase. Their currency value has, of course, considerably risen, but ample provision has been made for any depreciation in terms of sterling that has occurred. Stocks, cash, debtors, and creditors at stations are all converted at the rate ruling on the day of balancing. Foreign loans and investments are all valued at the rates and prices ruling on the day of balancing—that is to say, at Dec. 31—and the necessary provision is made for depreciation. Although we have one or two other reserves, as an extra measure of precaution the Board have this year allocated the sum of £60,000 to exchange and contingency account, so as to provide against any further exchange depreciation and against certain charges of an unforeseen character.

EXCHANGE AND CONTINGENCY ACCOUNT.

Now, in considering the amount put to exchange and contingency account, you will notice the inclusion of the word "contingency." In the old days we had a contingency fund, but this was swept away after the war. Now, a fire occurred at the Antwerp Docks. Our lamplighter stumbled over a bale of goods when lighting a lamp, and his torch fell on these goods. A fire was occasioned, and a loss of £9000 in sterling was incurred. Some portion of the loss we were insured against, but it was a loss of a very unusual character, and one which we should not in the ordinary course of business have insured against. We went to law over the matter to try to make somebody else liable, but lost our case, and we have had to pay £9000 out of the profits of this last year. In case anything of this unforeseen nature should occur again, when we should not have money from the Germans or elsewhere to make up for the loss, we have thought it advisable to make this provision.

DIVIDENDS ON INVESTMENTS.

Now I will turn to the next item—dividends on investments. You will see that this is down to the extent of £22,393. We, of course, no longer have the interest that we got from the Clearing Office in 1922. Then again, we thought it advisable—and it has shown itself to be—to have all outstanding money back from France. We had this money back from France, where it was earning very good interest, and when we brought it home it was not earning such high interest, and our income suffered. We have also had some loss of interest by making a change of investments. I will give you a practical example of that. We had over £100,000 of 1927 5 p.ct. Treasury Bonds, bought at 99, and we sold them at 102. The proceeds we invested in Metropolitan 3½ p.ct. due in 1929. In this way, although a loss of income occurs, we make money in the long run, because we do not have to pay any income-tax or corporation duty upon the premium that will naturally be our due. Then I come to the question of the "Revenue Proportion of German Compromise." I should like to explain this matter in detail to you, and I will tell you how the change came about. It was through the action of the Inspector of Income Tax who deals with us. I know it is very much the custom to abuse anybody who is connected with income-tax, but I can only say that I myself, in many positions, have always found them extraordinarily able and courteous people. They have invariably proved themselves—particularly when they have to deal with old-established companies, who treat them honestly and well, as this Association do—ready to assist one in every possible way. But, of course, Inspectors of Income Tax are, after all, human beings, and have to protect the interests of the State as well as assist the taxpayer. It was, consequently, decided by the Board of Inland Revenue that, to simplify the Association's position, the first instalment should be regarded as entirely accretion to capital, but that subsequent instalments must be apportioned over capital and revenue. The second instalment was also to be regarded as containing a double proportion of revenue, in order to compensate the State for loss of tax on the first instalment.

POSITION RE GERMAN COMPROMISE.

The Association agreed to a compromise of £1,600,000 in respect of their claims under Article 297 of the Peace Treaty, for inadequate liquidation price and for interest due up to the date of the compromise. Of this, £50,000 represented the German Liquidator's charges, which had to be refunded to the Association at once. Payment of this sum, less commission, was made through the British Clearing Office on Feb. 28, 1922. The Mixed Arbitral Tribunal made an award in respect of the balance of £1,550,000, which ranks for payment out of funds held in this country only as, and when, the Controller of the Clearing Office is satisfied that there is a sufficient sum to cover priority claims (*i.e.*, pre-war debts and proceeds of liquidation). For this reason, distribution proceeds slowly, and by instalments.

The first instalment, which was paid on Jan. 15, 1923, and was incorporated in the accounts of the year 1922, amounted to (net)	£188,948	18	1
The second instalment was paid on July 31, 1923	188,900	3	1
The third instalment was paid on Jan. 31, 1924	188,930	3	1
Making a total receipt of (net)	£566,749	4	3
If we add to this the refunded charges of the German Liquidator (net)	49,750	0	0
We arrive at a net total payment of	£616,499	4	3

This has been apportioned over capital and revenue as follows:

Capital	£436,700	0	8
Revenue	179,799	3	7
	£616,499	4	3

The revenue proportion has been incorporated in the accounts of the year 1923, which are now before you. Of the capital proportion, the 12 p.ct. special dividend paid on June 15, 1923, utilized	£237,113	7	8
The proposed special dividend of 10 p.ct. which is the subject of a resolution to-day will require	197,600	0	0
	£434,713	7	8
Leaving a balance to be carried forward of	1,986	13	0
Total capital proportion	£436,700	0	8
Of the gross compromise of	£1,600,000	0	0
The Association have therefore received the gross sum of (*i.e.*, before deduction of the Clearing Office's commission)	631,281	5	0
Leaving to be received (gross)	£968,718	15	0
From this must be deducted the commission of the Clearing Office at 2½ p.ct.	24,217	19	4
Making a net sum receivable of	£944,500	15	8

Of which £644,860 19s. 4d. would be applicable to capital and £299,639 16s. 4d. to revenue.

MORE FIGURES FROM THE ACCOUNTS.

Now, returning to the accounts, expenses in London show a reduction of £11,500, due to the fact that certain payments we made to our staff—bonuses for the splendid work they did getting this German compromise through—do not appear this time. Then the renewals fund is by way of a reserve for expenditure on short-lived plant. Income-tax and corporation profits tax is very large—over £100,000. Of course, one fact about this is that, in connection with the three years' average, the lean years during and after the war disappear, and now we have bigger amounts to deal with; and there is the German compromise, on which we have to pay income-tax. There still appears also that horrible corporation profits tax (which, however, will not appear much longer), and this is accountable for no less than £17,000. Then you will see interest on debenture stock is down, owing to purchases; and general amortization account is less compared with last year, because we have renewed some concessions. With regard to legal charges, there was first of all the lawsuit which I referred to on the last occasion about the debenture stock, and then there was a case we were asked to take to the Mixed Tribunal, to try to force the German Government to hurry up with their payments under the compromise, or else that we should be allowed interest for the non-user of the money due to us. I am sorry to say that, in spite of the case being well argued by our Counsel, judgment was given against us, and as there is no appeal from the Mixed Tribunal there is nothing more to be said on the subject. The exchange and contingency account I have already explained.

THE BALANCE-SHEET.

Taking the balance-sheet, on the right-hand side, works, mains, &c., are up by £161,787. I may say that again electricity is responsible for more than half of this, our electricity station at Brussels taking no less than £86,962. Under freehold land there is an increase, owing to a block of land which we bought next to our gas-works at Forest. Stocks at stations are up by £23,603, also chiefly due to the Brussels electricity station having additional stores. Cash at stations is down by nearly £40,000, owing to the fact that we do not, consequent upon the uncertainty of exchange, wish to leave abroad any more money than we can help. The sundry debtors figure is very much the same. That includes the German claims money, £188,900. I need hardly refer to loans in London. Loans to foreign gas and electricity companies are down by a very large sum, owing to the fact that we have had repaid to us the loan we had made to the Lille Electricity Company, who have been absorbed by the Compagnie Continentale du Gaz. Under freehold property in London and abroad there is a small change, because one of the houses that we acquired many years ago round our Flushing works has been incorporated with the gas-works. Reserve fund investment at Dec. 31 remained the same. I may say that we thought it proper to convert this into the new 4½ p.ct. Loan, so it will appear in a different guise next year. The pension fund investment is unchanged; and English, Colonial, and Indian securities are practically the same. Foreign gas and electricity companies are a little down. We have had to write-down some of our holding in the Hungarian Company, but this Company, like the Vienna Gas Company, is nevertheless making progress, though it is necessarily slow. Our principal holding did not need to be written down—43,164,000 frs., out of the total capital of 50,850,000 frs., in the Compagnie Continentale du Gaz. They paid 10 p.ct. in 1923, and they have already paid an interim dividend this year of 6 p.ct. for the six months. I may say that the quotation for these 500 fr. shares on the Paris Bourse stands at 1250 frs., and therefore I do not think you need be alarmed at the value placed by us on this holding. This Company are making rapid progress in electricity at Lille; and they are finding what we find in connection with our Brussels electricity station, that where gas companies are loth to spend £10,000, electricity companies think nothing of £100,000. Under new concessions they are obtaining they will lay down an electrical network in the suburbs. In fact, most of the suburbs of Lille will soon be covered with electric cables. This is very costly, and the Company are going to double their capital. The French Board have resolved to call up a quarter of this new capital, with a premium of 50 frs. per share, in the autumn of next year, when, of course, the due resolutions have been carried at a general meeting of the Company. To show you how useful this sum of money invested in English, Colonial, and Indian securities is, I may say that this 25 p.ct. call on our French holding will cost us, at to-day's price of the franc, about £200,000; and therefore, unless we get something

meanwhile from the German compromise, we shall probably have to liquidate some of these holdings in order to satisfy this call. Miscellaneous foreign securities are down, because, again, we had money in France, in bonds of the Défense Nationale, which, when the bonds fell due, we had remitted to London.

THE 3½ P.CT. DEBENTURE STOCK.

On the other side, nothing to begin with calls for remark, except the 3½ p.ct. debenture stock. There is a reduction of this of no less than £137,490. We made purchases direct, and we made purchases in the open market, and in the end we offered our shareholders 3½ p.ct. Conversion Loan in exchange for an equal holding of debenture stock. How well these people did to accept the offer I need hardly say, because at present our stock stands at 70, and the Conversion Loan at 77. Still, not everybody, I am glad to say, did accept it. We did not want everybody to do so, because we wanted to have money available for the purpose of which I have told you. But it had some good effect in this way: At the end of 1922 we had 894 accounts, of which 314 were not over £100; and this number has since been reduced to 476 accounts, of which 114 are not over £100. So that we have a reduction of 418 accounts, which is a most desirable thing so far as work in the transfer office is concerned. It is true we have lessened our assets by £125,462, but then we have our liabilities reduced by £183,907, so that there is a nice book profit which is hidden away down below in sundry creditors—you do not see it, but it is there.

GOOD WORK OF THE STAFF.

We have an excellent staff in every department, but I should like here to give a word of praise to the work done in our Registrar's office. Mr. Hinman, who has served the Association ever since I can remember—and I have been connected with it for a great many years—retired on a very well earned pension, and he was succeeded by Mr. Phillips, who comes of an old "I.C.G.A." family. He represents the second generation of the Phillips family in our office, and I am glad to have this opportunity of testifying to the good work carried out by him in connection with the matter to which I have been referring. As to amounts unclaimed by sundry stockholders, at the present moment there is only £2947 16s. due to eleven proprietors. Then there is nothing at all to comment upon until we get to sundry creditors, which amount is up by £60,100, principally for the reasons I have given. I do not think there is any other matter in the balance-sheet with which I need trouble you. I should like to say this in conclusion—that, though I have been connected with this Association for a great many years, for a Director I hardly remember a year which has been quite as troublesome and vexatious as 1923. I do not say it has been a disastrous year. I am not going to compare it with events like the loss of Amsterdam (which was more a blow to our prestige than to our pockets), or the loss of Vienna or Berlin (which were great blows, but were rather the subjects of sorrow than of anxiety), but I speak of the administration of the Association's affairs, both on the Continent and at home, and I repeat that I do not remember a year which has been more troublesome and vexatious. And these troubles, and these vexations and anxieties, have only been overcome through our being served by a very magnificent staff both here and abroad. It has often been the custom, at the end of the meeting, when shareholders were hurriedly leaving, for a vote of thanks to be proposed to the staff which was received with about as much enthusiasm as a vote of thanks to the Directors for their services during the past year, and to the Chairman for his able conduct of the meeting. Well, instead of asking you to accord a formal vote of thanks of this character to the staff at home and abroad, I should like to give testimony, on behalf of myself and my colleagues, to the excellent work done by the staff during the past year, in a time of great anxiety and trouble. We are served equally well by all, and it is rather difficult for me to single out any particular person. Our works are under the same managers that we had before the war, and they have done most exceedingly well On my left is a gentleman—Mr. James—who has been in his present office of Secretary now for two years. It is a difficult task for anybody to follow with success in a post so long and ably held by Mr. R. W. Wilson. [Applause.] But Mr. James has come through the past year with absolutely flying colours. He is a man of brains and culture and great industry, and, what I value almost as much, of a very fine initiative. I thank you, Mr. James. [Applause.]

THE DIVIDENDS.

I now have formally to move:

> That upon the holdings of capital stock as registered in the books of the Association on the 22nd of April, 1924, a final ordinary dividend for the year ended 31st December, 1923, be paid on the 20th May, 1924, less income-tax at 4s. 7½d. in the pound (being the average rate for the year) at the rate of 5 p.ct. actual, making with the interim dividend of 5 p.ct. actual paid on the 15th November, 1923, a dividend of 10 p.ct. for the year, and leaving £45,951 6s. to be carried forward to the next account.

The DEPUTY-CHAIRMAN: I beg to second that.

The motion was put to the meeting and carried unanimously without discussion.

The CHAIRMAN: I now have to move:

> That the sum of £199,586 13s. received from the realization of the German assets, being an accretion to capital which has been realized and turned into money, be dealt with as profit and applied in payment of a special dividend for the year, 1923, at the rate of 10 p.ct. per annum on the nominal amount of the issued capital stock of the Association, such dividend to be paid on the 20th of May, 1924, upon the holdings of capital stock as registered in the books of the Association on the 22nd of April, 1924.

The DEPUTY-CHAIRMAN seconded this, and it was unanimously agreed to.

The CHAIRMAN: I next move:

> That the accounts, together with the scheme for the appropriation of the profits, which have been submitted, be received, adopted, and entered upon the minutes.

The DEPUTY-CHAIRMAN seconded this, and it was agreed to.

RE-ELECTIONS.

The DEPUTY-CHAIRMAN: It now becomes my duty to propose:

> That Sir Charles Jessel, Bart., be re-elected a Director of the Association.

Sir HENRY BIRCHENOUGH, Bart., K.C.M.G., seconded the resolution, which was carried.

The CHAIRMAN: I propose:

> That Sir Henry Birchenough, Bart., K.C.M.G., be re-elected a Director of the Association.

The Right Hon. Sir GUY D. A. FLEETWOOD WILSON, G.C.I.E., K.C.B., K.C.M.G., seconded, and it was agreed to.

The CHAIRMAN: I now move:

> That Mr. H. G. Newton be re-elected a Director of the Association.

Mr. HAROLD G. PALMER seconded the resolution, which was carried.

The proceedings concluded with the re-appointment of Mr. T. B. BASSETT as an Auditor of the Association, on the proposition of Mr. BARCLAY, seconded by Mr. JOHN DEANS.

CITY AND GUILDS OF LONDON INSTITUTE.

Examinations in Gas Supply.

The following questions were set by Mr. H. Kendrick in the recent City and Guilds of London Institute Examinations in Gas Supply. In each case not more than eight questions were to be attempted. The maximum number of marks obtainable is affixed to each question.

GRADE I.

1. (*a*) A gas undertaking has to supply a district which gradually rises to 350 ft. above the gas-works and then falls 250 ft. below the highest part, the only practical road to supply the lower area passing directly over the highest part. It is necessary to maintain a minimum 3-in. pressure in the area around the works, and in the distant low area as well. What pressures would you expect to obtain in the higher and lower districts when the mains are fully equal to meeting the maximum demand, and what special plant and mains would be required to maintain a maximum of 4-in. pressure in the higher levels? (45.)

   or

   (*b*) Sketch, with full dimensions, one form of low-pressure and one form of high-pressure gas-main joint. Describe in detail the method of jointing and the precautions to be taken to ensure a sound joint. (30.)

2. (*a*) Describe and sketch in detail the working parts of a "Shorts" leakage detector. How is it used? Describe the method of its use in locating leakages in mains. (35.)

   or

   (*b*) A service main is 200 yards long. The first 75 yards are laid with a rise of 12 ft. and the remainder with a fall of 7 ft. What provisions are necessary to ensure a satisfactory supply? If the pressure at the connection with the trunk main is 3 in., what will it be at the highest part and at the end of the service, assuming no loss from friction? (30.)

3. (*a*) Name four deposits frequently met with in mains and services that have been in use for a considerable period of time. How are they generally caused, and how can they be prevented? (45.)

   or

   (*b*) A main has gas entering at one end only, and several consumers on it whose supply must not be interfered with by day or night. How would you insert a tee branch in it? Describe and sketch the apparatus that you would use and the method of carrying out the work. (30.)

4. (*a*) What means are employed in wet meters for preventing "slow" registration? Give one method of maintaining an unvarying water line in wet meters. (30.)

   or

   (*b*) Describe and sketch the construction of a dry meter. Explain the working of the valves and registration. What are the causes of "slow" registration? (30.)

5. State, in percentages, the composition of the following alloys, and the influence each component has upon the finished material: Brass, gunmetal, solder. In what way are two pieces of compo or lead pipe joined by means of a blow-pipe, and what precautions have to be observed? (30.)

6. Gas is frequently used to assist ventilation in large buildings. How is this done? How does gas help in the ventilation of living rooms? (30.)

7. Bunsen flames in gas-burners with luminous tips are frequently met with by the maintenance staff. What are these due to, and how can they be remedied? Give particulars of three different causes. (40.)

8. State the causes and prevention of mantle breakages. What effect has the use of globes on the distribution of light from incandescent gas-burners? Give illustrations in support of your statements. (35.)

9. Sketch in vertical section a "Littleton" lamp, and describe fully the functions of each part. (30.)

10. (*a*) Supposing that a gas-engine has undergone a thorough repair, describe the operation of starting it up again, including the regulation of gas into the cylinder. What form of ignition do you consider most satisfactory, and why? (40.)

    or

    (*b*) Describe and sketch in vertical section a ventilating gas-fire, and one arranged for reducing heat losses that at the same time distributes warm air into the room. (35.)

11. Sketch in vertical section Parkinson's cottage water heater, and explain its working. (35.)

FINAL EXAMINATION.

1. (*a*) State in general terms the regulations in the Gas-Works Clauses Act, 1847, governing the powers of a gas undertaking to lay pipes in streets or lands not dedicated to the public use. Are these regulations now varied in Private Acts? [If so, in what way? (35.)

or

(*b*) What tests would you apply to demonstrate the relative efficiency of various forms of lead and other joints in general use for mainlaying purposes, bearing in mind common causes of leakage from such joints? (30.)

2. (*a*) What are the duties of a gas undertaking after breaking-up a street, road, or bridge, both during the progress of the works and after completion?
What powers has a Local Authority in case of delay or omission to carry out its statutory obligations? In a recent law case the verdict was given in favour of the gas undertaking. What was the defence? (35.)

or

(*b*) Discuss the advantages and disadvantages of heating rooms with gas-fires of the "Radiation," "Sunbeam," and the new "inclined" types. (30.)

3. (*a*) Describe and sketch in cross-section an enamelling and lacquering stove that ensures complete exclusion of products of combustion from the work being stoved and uniformity of temperature in all parts of the stoving chamber. (40.)

or

(*b*) Describe and sketch in cross-section a "surface combustion" rivet heater capable of heating 100 lbs. of rivets per hour, giving sizes and details of gas-burner and pipe connections. State the cost of gas per lb. of rivets heated when using gas of 475 B.Th.U. quality costing 8d. per therm. (40.)

4. (*a*) A gas-main 2400 yards long, which was originally of 10 in. diameter throughout its length, is enlarged for the first half of its length to 15 in. diameter, and at the point of reduction is connected to an 8-in. diameter main 900 yards long. State the capacity in cubic feet per hour of: (*a*) The original 10-in. diameter main; (*b*) the new 15-in. diameter main; (*c*) the shortened 10-in. diameter main; (*d*) the new 8-in. diameter main.
The sp. gr. of the gas supply is 0·49, the initial pressure 4-in., and the pressure at the end of the 8-in. and 10-in. mains 3-in. water gauge. The levels at the reducing pipes are 100 ft., and at the outlet ends of the 10-in. and 8-in. mains 50 ft. above the inlet end of the 15-in. main. (30.)

or

(*b*) You are instructed to light-up a closed-in shop window 12 ft. wide by 10 ft. high and 6 ft. deep, generally used to display dark goods. How would you comply with these conditions and avoid glare? State the burners that you would use, the total candle power, and the size of the main gas-supply pipes. What means would you adopt to get rid of the heat and products of combustion? (30.)

5. (*a*) Spun cast-iron pipes are now being used in considerable quantities. Describe the method of their manufacture, and state their advantages and disadvantages as compared with the older method of producing cast-iron mains.
Spun concrete pipes are also being produced; describe their manufacture. Can they be used economically for gas distribution? State your reasons. (35.)

or

(*b*) Describe and sketch in detail a change-giving attachment to a prepayment meter. Discuss the advantages and disadvantages of the system. (35.)

6. (*a*) What is a therm, and a British thermal unit? The declared value of a gas supply is 475 B.Th.U., and a consumer uses 47,000 c.ft. per annum. How many therms does this represent? The original charge was 3s. 2d. per 1000 c.ft. What is the equivalent charge per therm? (30.)

or

(*b*) What type of multiple nipple burner would you adopt for street lighting, so as to ensure even lighting along and across a narrow street? Give a detailed sketch and description of the burner proposed, and of a "hurricane-proof" lantern designed to give maximum lighting efficiency. (30.)

7. Sketch in elevation and vertical section, through two floors of a house, an arrangement of ventilating and products flues that will displace the chimney-breasts usually provided for coal fires. Show alternative arrangements for discharge of products of combustion and vitiated air into the atmosphere. How do these proposals affect the floor area and cubic capacity of a room and the costs of building? (30.)

8. Describe and sketch in vertical section a governor suitable for general use in the district for reducing gas in the mains from 10 lbs. per sq. in. to 4-in. water gauge pressure. State the precautions necessary for satisfactory working. (30.)

9. Gas-heated radiators are popular for garage heating. Sketch and describe the "Davis," the "Ventibeta," the "Garago," and the "Deighton." State which are suitable, and why; and their advantages and disadvantages and running costs per annum, based on 1000 hours use for a garage 20 ft. long by 10 ft. wide and 8 ft. high to eaves, and constructed of wood. (40.)

10. It is a well-known fact that the ordinary type of consumers' meter, if worked above its nominal capacity, reduces the pressure more or less excessively. To which parts of the meter is this mostly due, in both dry and wet types? Can this be overcome, and the capacity of meters of equal external size be increased, without affecting the correctness of the registration and the pressure of the gas at the outlet of the meter? Describe two meters now on the market that effect this. (30.)

11. What are the advantages and disadvantages of a suction gas plant and town gas for power purposes? What will, to a user, be the relative capital costs, repairs, and running costs of a 50 B.H.P. set, the gas being supplied at 480 B.Th.U. per c.ft. and 8d. per therm? (40.)

BRITISH INDUSTRIES FAIR.

Gas Equipment at Birmingham.

The display of gas equipment at the Birmingham Section of the British Industries Fair (now being held at Castle Bromwich, and which was visited on Saturday, May 17, by H.R.H. Prince Henry) is small and unrepresentative of the industry. At the same time, however, some important firms are represented, and the standard of quality of the exhibits is extremely high.

The Fair, which will remain open until Friday, is housed in two huge hangars which are connected by a long wide corridor. These buildings are filled with stands upon which are displayed manufactured goods representative of the diverse industries of Birmingham and the Midlands. There are, of course, many exhibitors from other parts of the country.

The present is the fifth annual Fair held at Castle Bromwich. It is organized and controlled by the Birmingham Chamber of Commerce (which is the largest organization of its kind in the provinces), and is under the auspices of the Board of Trade—some of whose leading officials have been in regular attendance at the Fair—and the Birmingham City Council. There was no formal opening ceremony, though a number of the leading business men of Birmingham and the Midlands lunched with the Council of the Fair. The chair was occupied by Mr. H. Lakin-Smith, the President of the Chamber of Commerce, supported by the Lord Mayor of Birmingham (Alderman T. O. Williams), who proposed the toast "Success to the Fair." He declared that it was a revelation of Midland industry and a triumph for Birmingham.

As hitherto, the Fair is open only to exhibits made by British manufacturers and to British wholesale firms taking the whole output of a British factory or holding the sole selling rights of patented or proprietary articles manufactured in the British Empire. The public is not admitted in the ordinary way, though facilities are afforded by which employees of manufacturing firms may pay a visit of inspection to the Fair. The Fair is divided into eleven groups, which are as follows: (1) Brassfoundry, Hardware, and Ironmongery; (2) Metals; (3) Construction, Building, and Decoration; (4) Power, Lighting, Heating, Cooking, and Ventilating; (5) Engineering; (6) Agriculture; (7) Mining; (8) Motors, Motor Cycles and Cycles, Cycle Accessories and Perambulators; (9) Guns, Saddlery and Harness, and Fishing Tackle; (10) Brewing, Distilling, and Catering; and (11) Services.

For the most part the goods are displayed upon open stands. Some of the largest manufacturing firms of the Midlands are this year showing at Wembley, so that they are absent from Birmingham; and this is very noticeable in the display as a whole. Still, many new names are in the catalogue. Hardware, as might be expected, occupies most space; and there is an extremely good display of building material and hearth furniture.

The Industrial Research Laboratory of the Birmingham Gas Department (whose valuable work for metal manufacturers and others on the research side is acknowledged) have an interesting working exhibit close to the main entrance. This stand is divided into two sections; and in one section, to demonstrate the activities of the Industrial Research Laboratories, a 30-ton tensile and compression testing machine, made by Messrs. W. & T. Avery, Ltd., Soho, is installed. This machine is electrically driven, and is of the single-lever vertical type, provided with a split poise so as to use the full scale capacity of 30 tons, and also to run the machine over its full scale with a load of 5 tons. Arrangements are also made for tensile and compression tests to be carried out for firms exhibiting at the Fair. A small repetitive impact testing machine, manufactured by Messrs. The Cambridge and Paul Instrument Company, Ltd., is shown under working conditions.

On the other portion of the stand, the activities of the Industrial Heating Section of the Department are demonstrated by means of an installation of a new type of regenerative high-temperature muffle, heated by town gas. This furnace has a working hearth of 3 ft. 6 in. back to front by 2 ft. wide by 12 in. to the centre of the arch, and is arranged for firing with town gas at ordinary pressures, no form of fan or blower being used. The regenerative system is arranged beneath the working hearth, and the heat from the waste gases is by this means transferred to the incoming air used for the combustion of the gas and also pre-heats the gas itself, which passes through containers suitably arranged in the regenerator. This is typical of a number of furnaces recently installed for various firms in Birmingham and district, and is capable of attaining temperatures ranging from 1250° to 1400° C., such as are required for enamelling and ceramic firing. The furnace product of Messrs. Gibbons Bros., Ltd., of Dudley, has been designed in collaboration with the Industrial Research Laboratories, and has proved to be highly efficient from a fuel consumption point of view. Furnaces of this type may also be used with advantage for such work as re-heating, hardening, tempering, carburizing, and heat-treatment work generally. On this section of the stand are different forms of temperature measuring instruments and the latest types of thermo-couples. There is also a recent design of thermo-couple potentiometer, made by Messrs. The Cambridge and Paul Instrument Company.

A good deal of attention is directed to a muffle made by Messrs. Gibbons Bros., Ltd. This is of the water-sealed continuous type, and is used for bright annealing copper, brass, German silver, and other non-ferrous metals. This plant is on the new regenerative principle, is fired by town gas, and embodies a conveyor chain driving mechanism. The gas and air are preheated, and the combustion chamber is

underneath the floor. The gas passes round the muffle, and then through specially designed regenerative flues. Refractories of various types for industrial furnaces are also shown.

The South Staffordshire Mond Gas Company, of Dudley Port, show a large range of bye-products derived from coal in the Mond process of gas manufacture. The Company's products comprise acid and weather resisting bituminous paints, non-poisonous and non-caustic disinfectants, sheep and cattle dips, horticultural washes, fertilizers, weed killers, wood preservatives, &c. In the manufacture of Mond gas, there are produced oils which, unlike ordinary gas-tar oils, are free from carbolic acid, but possess a high germicidal value. These oils form the basis of the disinfectants, sheep dips, &c.; and it is remarkable that, while they are so potent in destroying bacteria, parasitic, and fungoid growths, and the lower forms of life, they are innocuous to the higher forms. This property allows of the use of such preparations for internal as well as for external disinfection. "Melanoid" bituminous paints, which have a well-deserved reputation as acid, alkali, and weather resisting, have hitherto only been produced in black; but this year they are being shown also in light red, dark red, brown, and green—all prepared from a pure bitumen base.

A small but fine collection of gas cooking ranges for domestic and hotel use is shown by the Falkirk Iron Company, Ltd. Prominent among them is the "Falcon" central range of six smooth-top units, such as are now in use in large numbers in the restaurants at Wembley. The flues are carried into a centre trunk chimney under the hob. The system is regenerative, and all the air used for combustion is preheated. Smooth-top kitchen ranges are also featured. The Carron Company show a standard cooker; Messrs. Parker, Winder, and Achurch, of Birmingham, the "New Emperor" cooker; and the Tilley High-Pressure Gas Syndicate, Ltd., tinmen's stoves, lined with firebricks. Other exhibitors are Messrs. L. M. Mills and Co., of Notting Hill (stove cleaner); G. Salter, of West Bromwich (gas-irons); and John Smith, Ltd., incandescent gas-burners.

Last Saturday, H.R.H. Prince Henry paid a visit of inspection to the Fair. He showed great interest in the demonstration of the work done by the Industrial Research Laboratories of the Birmingham Gas Department, and was impressed by the remarkable diversity of the industries of Birmingham and the Midlands.

NOTTINGHAM GAS UNDERTAKING.

While gratification has been generally manifested in Nottingham regarding the eminently encouraging financial results, which during the past year have again attended operations in connection with the Corporation gas undertaking, showing a gross profit of £165,502 and enabling £30,000 to be applied in relief of the rates, the feeling has not been unattended by a certain amount of criticism, based upon suggestions that, from one point of view, gas consumers may be regarded as bearing an unfair share of municipal burdens in contrast with those, who, while participating equally in the advantageous results accruing from the City's chief public trading enterprise, make no contributions themselves to the funds thus rendered available, they not being customers of the department. The idea has also been advanced that the continuity of strikingly successful annual financial achievements in relation to the undertaking has only been rendered possible by the maintenance of inordinately high charges; but the obvious reply to this is that a reasonable substantial margin of profit may be expected, having regard to the capital involved. The accounts which were presented at the last meeting of the Council show that, while redemptions have been for many years steadily progressing, the capital involved is still £903,644, of which nearly half consists of consolidated stock. Of the 7242 annuities originally created, representing a total amount of £369,434, no fewer than 1646, of the nominal value of £50 each, have been re-purchased, thus reducing the total indebtedness on this account to £279,800. Coincident with many important developments which have been effected, a sound financial policy has been consistently pursued of building-up reserve funds, which now total £188,947. Sinking funds also represent an aggregate of £303,851, while the renewals fund stands at the substantial total of £164,156, besides which £20,000 is available for the repair of retorts. Thus the financial factors in regard to the undertaking present ample cause for satisfaction. From an analysis of the accounts relating to the past two years, it is significant to note, in evidence of the constantly increasing cost of raw materials, that whereas the price paid for coal in 1923 (when 186,081 tons were carbonized, compared with 195,019 tons last year) was 21s. 9·65d. per ton, last year the cost was 23s. 5·80d. per ton.

The reply to the criticism as to the maintenance of excessive prices is clearly that the Committee have gone as far as can reasonably be expected, having regard to the financial interests involved. The proposed reduction in the price of gas will represent a loss of revenue of approximately £49,000 per annum.

Gas Going Ahead at Walsall.

Seven beds of horizontal retorts are to be erected in the derelict portion of a retort-house at the Pleck Gas-Works, the roof raised to accommodate the necessary coal storage hoppers, and a complete coal and coke handling plant installed, at a total estimated cost not exceeding £22,000. Alderman Warner, in proposing the adoption of the recommendation, spoke in glowing terms of the progress which was being made at the works, and said that the output was increasing greatly. The undertaking was going ahead, and these new retorts would be needed at an early date to make provision for the extra requirements. Mr. Starks wondered whether this new scheme would complete the liabilities so far as extensions at the gas-works were concerned. During the past year £40,000 had been spent on the undertaking, which seemed a lot of money. The recommendation was eventually adopted.

PORTSEA ISLAND GAS LIGHT COMPANY.

Revision of Standard Price.

An application by the Portsmouth Corporation for a revision of the standard price of the Portsea Island Gas Light Company was the subject of an inquiry by Mr. H. C. HONEY (Director of Gas Administration, Board of Trade) on Friday last. It was asked that the present standard price of 16d. per therm should be reduced to 10·76d. per therm. The Company did not dispute that there was a case for reduction, but held that the new price should be 11·9d. per therm.

The Corporation were represented by Mr. F. J. SPARKS (Town Clerk), and the Company by Mr. T. H. F. LAPTHORN (Chairman). The Portsmouth Trades and Labour Council supported the application of the Corporation, and were represented by Mr. G. W. POST (the General Secretary).

Mr. SPARKS, opening the case, said the undertaking was a sliding-scale one. Under the Company's Order of 1882, the standard price was fixed at 3s. 4d. per 1000 c.ft., and their standard dividends were 10, 9, and 7 p.ct. on the several classes of shares. Before the war they had been able to increase their statutory dividends by 3 p.ct., having reduced the charges to the consumer to 2s. 4d. per 1000 c.ft. (the slide being 5s. for every penny increase or decrease in the price of gas). He then referred briefly to the war period, during which costs increased, and relief was obtained by the Temporary Increase of Charges Act, which led up to 1921, when the Company obtained their Order under the Gas Regulation Act, giving them a standard price of 16d. per therm—although the Company had asked for 16·4d. per therm. Comparing the pre-war standard with that fixed in 1921, Mr. Sparks said that the pre-war price of 3s. 4d. per 1000 c.ft. was equivalent to 8d. per therm. At the time the facts upon which the standard price of 16d. was based were put forward, prices were at their highest, or very nearly so, and, in addition, the difficulties through which the country was passing made estimates extremely difficult and problematical. Owing to the substantial drop in the cost of manufacture of gas since then, the Company were now in an unduly favourable position; and if this figure of 16d. per therm remained, the consumers would lose the benefit which Parliament had intended them to have by the operation of the sliding-scale. This point of view was accepted by the Company. He understood the Company accepted the Corporation's figure of 10·76d. per therm, subject to a further reduction of 0·05d. in respect of a reduction in the original estimate of the cost of coal, so that they started on common ground, on the basis of 10·71d. On the other hand, the Company claimed additions, which brought the new price to 11·9d. The Company claimed increases in respect of coal contracts entered into at a higher price than previously. In regard to coke, the Corporation considered that the price charged by the Company (34s. per ton) was below the market price, and that the figure in the accounts should be nearer the market price. As to an item of £3000 in the accounts (the estimated cost of substituting larger services, necessitated by increased consumption of gas), the Corporation considered this should be a capital charge, and not be met out of revenue. A claim was made for economies effected since the 1921 Order through circumstances within the control of the management, but the Corporation objected to the Company's taking credit for economies which ought to have been, but were not, effected prior to the 1921 Order. Another claim made by the Company was in respect of the cost of increased salaries and wages, and additional holidays which had to be granted. The results of the working during 1923, at a charge of 8·6d. per therm, had enabled the Company to pay their pre-war rates of dividend—*i.e.*, 13, 12, and 10 p.ct. respectively. On the present standard of 16d. per therm, there was a margin of 7·4d., which, in the view of the Corporation, was much too high. The application by the Corporation was by no means hostile. The parties were on a friendly basis, and the Corporation merely wanted to be sure that a standard price was fixed which would enable the Company to maintain their pre-war dividends.

Mr. *John Moffitt* (Borough Treasurer and Accountant) handed-in an analysis of the 1923 accounts of the Gas Company. In the main, his evidence was in the nature of a request for further information. With regard to coke, he said that, if the Company were charging an inadequate price for it, they were prejudicing the position of the gas consumers to the advantage of the coke users. The primary duty of the Company was to supply cheap gas, and not cheap coke. He was advised that 34s. per ton was much below the figure the Company should have obtained for it. It should be just sufficiently below the market price to enable them to dispose of the coke, but should still have relation to the price of coal. He also suggested that the price secured for other bye products should be higher than that obtained last year, if, as put forward by the Company, the price of coal had increased; and he wished to know whether other companies were also failing to obtain an increased price for bye-products. Witness agreed that the Company should take credit for improvements effected through circumstances within their control, but disagreed with the figure put forward by the Company, because it took into account economies which ought to have been effected prior to 1921. It was local knowledge, he said, that the efficiency of the works was not for many years before 1921 what it ought to have been; and improvements which were effected since, but which ought to have been effected previously, should not be included. The undertakings at Nottingham and Leicester were up-to-date, and were comparable in size with the Portsea concern, and he asked that figures of the amount of gas produced per ton of coal in 1914 and in 1921 at Nottingham and Leicester should be compared with similar figures in respect of the Portsea undertaking. He was informed that the Portsea figures at both those dates would be found to be below those for Nottingham and Leicester. If this were so, then he suggested that the Portsea Company were not up-to-date.

This concluded the case for the Corporation.

Mr. LAPTHORN then put forward the contention that the Portsmouth Trades and Labour Council had no *locus standi* to appear in support of the Corporation's application. It had been advertised in the local

Press that any objections must be sent in to the Board of Trade not later than March 27, and that a copy of such objections should be forwarded to the Secretary of the Company. No communication had been received by the Company from the Trades and Labour Council; and until their representatives appeared at the inquiry, the Company were unaware of their intentions. However, if Mr. Honey agreed that they were not entitled to be heard, strictly speaking, and if the representatives of the Trades and Labour Council understood that they were present purely as a matter of favour, and not of right, the Company had no objection to their making whatever representations they wished to make.

Mr. Honey said that, clearly, if the Council had not complied with the rules, they were not entitled to be heard. He did not think, however, that the Company would be at a disadvantage if the Council's representatives were heard.

It was indicated at this point that, in addition to supporting the Corporation's application generally, the Council wished to point out, with regard to the sliding-scale, that the amount of the slide on the different classes of shares should be revised.

Mr. Lapthorn, on behalf of the Company, then referred to the Corporation's suggestion that they should charge more for coke in order to sell gas more cheaply. The Company, he said, were traders, selling gas, coke, and other products, and they tried to take a broad view. The price charged for coke varied to some extent with the price of coal; but there were reasons why the price of coke was, perhaps, a little lower than it would otherwise have been. One of the gas-works was situated at Flathouse, in the centre of the town; and periodically, when the coke market was sluggish, there had been a large accumulation of coke in the yard, which had made it almost impossible for the Company to carry on their work. It was necessary, therefore, to establish and maintain a steady market in the town; and they considered they were doing the best for themselves and the consumers thereby.

Mr. Sparks said he had only suggested that, for the purpose of arriving at the proper standard price, it was necessary that the Company should give credit for coke at the market price. He did not say they should sell at any particular price.

Mr. Honey said the Corporation were in a delicate position, because they did not wish the price of coke to be raised. What the Corporation said, in effect, was that if the Company were benefiting consumers of coke by charging less than the market price, the deficiency ought to come out of the pockets of the Company.

Mr. Lapthorn remarked that surely the market price was the price that could be obtained in Portsmouth, and he considered the present price was a fair one under present conditions. He asked Mr. Honey to find that the Company's policy was a wise one, because that was the best price at which they could sell the coke in sufficient quantities to prevent accumulation at the works. As to the suggestion that the present standard price enabled the Company to pay dividends higher than before the war, he said they had never thought of increasing them beyond the pre-war figure.

Evidence was then given on behalf of the Company by Mr. *H. A. Stibbs* (Secretary) and Mr. *T. Carmichael* (Engineer). The witnesses sat together in the witness box, and dealt in detail with various items in the analysis of the 1923 accounts, each question put to them being answered by the appropriate witness.

Mr. Stibbs said he agreed with the figure of 10·76d. as a basis (because it was calculated from the published accounts for 1923), subject to the amendment in the estimate for coal already mentioned by Mr. Sparks. The Corporation had submitted a statement, based on the 1923 published accounts, but agreed that, in so far as the 1923 accounts did not represent present-day costs, adjustments were necessary. The Company had submitted a similar statement, but they had adjusted the figures in the 1923 accounts to the present-day costs. This showed the present cost of supplying gas to be 7·48d. per therm, or 3·22d. in excess of the 1914 figure. This 3·22d., added to the equivalent of the pre-war standard price, which was 8d., gave 11·22d. as the new standard, compared with the Corporation's figure of 10·76d., a difference of 0·46d., which was due to the adjustments to which he had referred. To the 11·22d. the Company had added 0·68d., representing economies within the control of the management, introduced since the application for the 1921 Order was made—namely, December, 1920. This brought the figure to 11·9, which the Company submitted should be the new standard price, subject to the amendment in the coal estimate. There was little doubt that, had the Corporation been able to adjust their figures to present-day costs, and had they been able to estimate the value of the improvements to which they admitted the Company were entitled, their final figure would have differed very slightly indeed from that of the Company.

With regard to coal prices, Mr. Stibbs said the average price paid in 1923 was 30s. 3½d. per ton, and the estimated average price for 1924 was 31s. 9d. Contracts had already been arranged for Somerset coal at a price which was 1s. per ton in advance of last year's price, and coal would also have to be purchased from the Midlands, which it was estimated would be 2s. 9d. per ton dearer than previously. The average increase for the year would be 1s. 5½d.

Asked why it was necessary to go to the Midlands, Mr. Carmichael said that the Company could not obtain such good results if the whole of the coal came from Somerset. Somerset coal was the worst in the country.

As to coke, Mr. Stibbs said the average price obtained last year was 29s. 11d. per ton. The yard price, then and now, was 34s., but from this had to be deducted the commission allowed to merchants, while contracts for large quantities had also been entered into at lower prices than 34s. He did not think they could ensure the disposal of the whole production, if the price were higher. In this connection, he pointed out that, on the occasion of the inquiry into the revision of the standard price of the Gas Light and Coke Company, the price suggested by the London County Council was 29s. Mr. Milne Watson, on behalf of the Gas Light and Coke Company, had estimated 27s. 3d., whereas the Portsea Island Company estimated 29s. 11d., which was the price obtained last year. If the price were raised at Portsmouth, neighbouring companies could compete in the district, and the Company would not be able to keep their yards clear. At the time the Company had been troubled with the accumulation of coke, there had been considerable competition from outside; but at present there was nothing like so much.

Mr. Carmichael said that, on the date when the Corporation had made the application for the revision of price, the Company had orders for coke three months ahead, but to-day they were looking round for orders, and he was of opinion that in another week they would be stocking, unless the price were reduced.

In reply to Mr. Sparks, who asked if the Company had tried to sell at more than 34s., Mr. Stibbs said that if there were coke coming into the town from outside, as at present, it showed that the Company were very near the maximum at which they could sell in order to dispose of their production.

It was also pointed out by Mr. Carmichael that contracts made during the slump in the coke market last year, at 28s. per ton, were still running, and they reduced the average price. One such contract expired in two months' time, and would not be renewed. He did not

Cost of Supplying Gas at the Present Time.

Item.	Details. £ s. d.	Amount. £ s. d.	Per 1000 C.Ft. Pence.
EXPENDITURE.			
Coal (including freight and labour)		196,830 17 9	23·235
Less residuals, namely—			
Coke	58,261 3 3		6·88
Breeze	1,910 4 8		0·225
Tar and products	25,453 16 4		3·005
Ammonia and products	5,331 3 11		0·63
Coke and breeze used in manufacture	20,538 14 0		2·42
Total residuals		111,495 2 2	13·16
Net cost of coal		85,335 15 7	10·07
Oil (For water-gas manuf.)	12,974 15 0		1·53
Coke and breeze (For water-gas manuf.)	20,538 14 0		2·42
		33,513 9 0	3·956
MANUFACTURING EXPENSES.			
Salaries and wages		27,584 17 9	3·256
Purification		5,528 10 2	0·65
Repairs and maintenance of works and plant	74,718 5 6		8·82
Depreciation	6,278 7 11		0·75
		80,996 13 5	9·57
DISTRIBUTION EXPENSES.			
Salaries and wages of officials (including rental clerks)		12,049 8 10	1·42
Repairs, maintenance, and renewals of mains and service pipes		18,735 3 11	2·21
Do. of ordinary meters—repairs	12,607 18 2		1·49
Depreciation	3,026 18 9		0·36
		15,634 16 11	1·85
Less rent of ordinary meters		7,410 17 10	0·87
		8,223 19 1	0·98
Do. of stoves—repairs	22,581 14 4		2·66
Depreciation	5,012 5 0		0·59
		27,593 19 4	3·25
Less rent of stoves		24,639 5 0	2·91
		2,954 14 4	0·34
Do. of prepayment meters and fittings—repairs	1,487 12 7		0·175
Depreciation	275 10 8		0·03
		1,763 3 3	0·205
Less rent		29,156 13 7	3·44
	Cr.	27,393 10 4	3·23
RENT, RATES, AND TAXES.			
Income-tax	7,351 18 2		0·87
Less rents received	91 5 8		0·01
		7,260 12 6	0·86
MANAGEMENT EXPENSES.			
Office salaries and collectors' remuneration		5,938 4 10	0·70
Directors' allowances		1,575 0 0	0·185
Other charges		5,333 12 1	0·63
MISCELLANEOUS EXPENSES.			
Superannuation, sick, and accident funds		4,837 0 11	0·57
Co-partnership		—	—
War bonus and war fund		—	—
Leasehold renewal fund		—	—
Other charges		185 5 8	0·02
Total net expenditure on revenue account		272,658 17 9	32·19
Interest on temporary loans and consumers' deposits	4,019 19 0		0·474
Less interest received	341 7 11		0·04
		3,678 11 1	0·434
Interest on debentures or mortgages		8,759 17 5	1·03
Other charges		—	—
Total expenditure, including interest		285,097 6 3	33·66

expect an increase in the price of coke coincident with the anticipated increase in the price of coal, because there was not a great demand for coke round about Portsmouth.

Referring to the estimated prices of other residuals, Mr. Honey pointed out that a reduction of 30s. per ton on last year's price of sulphate of ammonia was estimated. Mr. Stibbs said that was because the world production of sulphate of ammonia had very much increased, and English sulphate was experiencing severe competition, especially from Germany. There was already a difference of 30s. per ton as compared with last year. A figure of £1060 in respect of salaries and wages was the cost of an increase of 2s. per week, *plus* 12½ p.ct., which operated from Jan. 1 this year, and four days additional holidays, in accordance with the agreement with the National Industrial Council.

As to the renewal of service pipes, and the question of whether this should be charged to capital or to revenue account, Mr. Stibbs said the Company had started a house-to-house inspection of pipes and appliances. In a great many cases the services were inadequate, and had to be renewed; and it was estimated that in the next few years they would be renewing about 2000. The average length was taken as 30 ft., and the cost, at 1s. per ft., was 30s. per service. It was pointed out by Mr. Honey that the Company would get their money back by reason of the larger consumption of gas which would result; but Mr. Stibbs held that most of the cost would have to be met out of revenue. There was the same amount of labour, for instance, in enlarging a service as in renewing one. All the pipes had been installed for some years, and were of no value, and to all intents and purposes the enlargement constituted renewal. The only increase of capital was represented by the difference in value of the pipes. They were taking out ¾-in. pipes and putting in 1-in. pipes. The difference in cost was 1½d. per ft., or 3s. 1d. per service.

Mr. *Stibbs*, in reply to the Town Clerk, agreed that in many cases it would not be necessary to renew the pipes at present, but for the need for enlarging them. It was true that it was largely a matter of enabling consumers to use more gas; but at the same time he pointed out that by carrying out these enlargements now the Company would not have to spend the money on renewals in a few years' time, which renewals would be met out of revenue. Out of the £3000, which was the total cost of the renewals, £312 10s. was charged to capital account, this amount representing the difference in the value of the new and the old pipes.

Mr. *Carmichael* then gave details of the manner in which economies in working had been effected.

ECONOMIES IN WORKING EFFECTED.

(1) New plant, or plant which had been reconstructed and improved in design, was brought into operation—namely:
- (*a*) In June, 1920, superheaters on boilers.
- (*b*) In November, 1920, new conveyors and charging machines.
- (*c*) In May, 1921, reconstructed and enlarged water-gas plants.
- (*d*) In August-October, 1921, reconstructed horizontal carbonizing plant.
- (*e*) In August, 1921, new installation of vertical retorts, complete with coal and coke handling plant; new locomotive coal grabbing crane; extension of telpher conveyor; and new coke screening plant to water-gas installations.
- (*f*) In September, 1922, reconstructed vertical retort plant.
- (*g*) In September, 1923, reconstructed horizontal retort plant, with "G.N." coke transporting machine.

(2) The installation of the new plant, the improvements effected in the reconstruction of old plant, the introduction of labour-saving plant and machinery, and the application of more scientific methods generally, have resulted in:
- (*a*) A higher yield of gas per ton of coal carbonized.
- (*b*) Higher makes of residuals for sale per ton of coal carbonized.
- (*c*) A saving in labour.

(3) The economies effected are based on the working results for the year 1923 compared with 1920, on the costs for which the present standard price was founded.

Coal.

Assuming the yield of gas had been as in 1920—*i.e.*, 63·73 therms per ton—the quantity necessary for the 1923 make would have been 134,239 tons, whereas 119,551 tons only were used, a saving of 14,688 tons, which, at 10s. 11d. (the net cost per ton), equals £8017.

Residuals.

Increased make for sale, per ton of coal carbonized—

	£
Coke	8 568
Tar	3,407
Liquor	1,022
	£12,997
Less credit for breeze	1,500
Total	£11,497

Saving in Labour.

For the year 1923, 9,922,956 therms were produced, so that 0·178d. per therm represents £7359.

It will be seen that, in the aggregate, these economies represent £26,873. This figure, divided by the total make of gas (*i.e.*, 9,922,956 therms), gives 0·68d. per therm.

Mr. Carmichael emphasized that he had only considered economies effected since the date of the application for the 1921 Order, and the efficiency of the works then was higher than it was in 1914.

Questions were put by the Town Clerk, who sought to show that the works were not so efficient in 1920 as they might have been. Mr. Carmichael, however, said that the inefficiency after the war was due to war conditions. Between 1918 (when he took over the works) and 1920, efficiency had been increased; but he had not taken credit for this when arriving at his figure of 0·68d. per therm. In his opinion, the works in 1920 were as efficient as they could be.

Mr *Stibbs* added that the price of gas sold by the Company compared with prices in London and other places, and it followed that the Company must have been carried on as efficiently as others whose prices were similar, or perhaps a little higher.

Mr. POST then voiced the views of the Trades and Labour Council with regard to the amount of the slide. There were three classes of stock, he said, and the slide should be proportionate to the statutory dividends. There was a 5s. p.ct. difference in the dividend for each penny decrease or increase in the price of gas, but the figure of 5s. should not apply to all three classes of stock.

Mr. HONEY said that if the slide in Portsmouth was 5s. on each class of stock, it was a rather unusual provision.

Mr. *Stibbs* pointed out that the premiums received were dependent on the rate of dividends on the various classes of stock.

Mr. HONEY said the fact remained that the provision was rather unusual, because, generally speaking, a 7 p.ct. stock carried a slide of 3s. 6d., and not 5s. However, he had no power to alter the slide in the Order he was asked to make. The point made by the Trades and Labour Council was a perfectly proper one; but they would have to wait until the Company applied for additional capital powers before they could have the matter dealt with.

The inquiry then closed.

TRADE NOTES.

"Coal."

This is the title of an illustrated booklet forwarded to us by the G. J. Eveson Coal and Coke Company, Ltd. The firm have their own coasting steamers, an extensive fleet of canal boats, railway wagons, and motor lorries, and are consequently able to carry out their contracts even in the most difficult times. The booklet contains typical analyses of different coals mined by the firm.

Glico Petroleum, Ltd.

The Gas Lighting Improvement Company have changed their name to Glico Petroleum, Ltd. It is thought that the alteration will be more generally acceptable to the trade, as it more closely identifies the Company with their actual activities in the motor spirit and petroleum trades. There has been no change whatever in the constitution of the Company, nor will there be in its policy. All contracts entered into under the old name will, of course, be carried out by Glico Petroleum, Ltd.

A New Gas-Plant Pamphlet.

Messrs. Ashmore, Benson, Pease, & Co., Ltd., of Stockton-on-Tees, have issued a new gas-plant pamphlet which will be of great interest to gas-works engineers and managers. It contains many fine illustrations of recent plants which the firm have supplied and erected, both at home and abroad, including gasholders, purifying plant, condensers, scrubbers, benzole refining plant, &c., and also a few illustrations of water-gas plants. The pamphlet forms a supplement to their general gas plant catalogue.

"Metallisation."

At the British Empire Exhibition (South-East Block of the Palace of Engineering, Stand No. 278, Bay 25), Messrs. Metallisation, Ltd., are giving daily demonstrations of "metallisation"—a process by which it is possible to coat any solid substance with an impervious layer of any of the useful metals or alloys, of any thickness from 0·001 in. upwards. Zinc, tin, lead, aluminium, copper, iron, nickel, brass, bronze, &c., can be deposited in this way. Among the purposes for which metal coatings have been employed are protection against corrosion, production of artistic effect, and enhancement of value.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate of Ammonia.

LONDON, *May* 19.

The London coal tar products market is quiet. Shipments of pitch for this season are nearly at an end, in consequence of the warm weather. The value of pitch for early delivery is therefore nominal; while about 65s. per ton *ex* makers' works seems to be the idea for Autumn shipment. Creosote is about 8½d. net per gallon in bulk at makers' works. Other products are unchanged.

Tar Products in the Provinces.

May 19.

The average values for gas-works products during last week were: Gas-works coal tar, 47s. 6d. to 52s. 6d. Pitch, East Coast, 55s. to 57s. 6d. f.o.b. West Coast—Manchester, 51s. 6d. to 52s. 6d; Liverpool, 52s. 6d. to 53s. 6d.; Clyde, 54s. to 55s. Benzole 90 p.ct., North, 1s. 5d. to 1s. 6d.; crude 65 p.ct. at 120° C., 1s. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 10d. Toluole, naked, North, 1s. 5d. to 1s. 6d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 7¼d. to 7½d.; salty, 7d. to 7¼d.; Scotland, 6½d. to 7d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 2s. 1½d. to 2s. 4½d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

Our correspondent for tar prices from the Manchester district writes: The average price realized for the sale of tar, according to the sliding-scale, for the month of March, was £3 6s. 1·33d.

The HALL MARK in IRON GOODS

IN your Consumers' and your own interests see that your GAS APPLIANCES come from CARRON — the Foundry where only *Hall-marked* goods are manufactured.

☛ *Write for a copy of the Company's New Cooker list No. 6F, enlarged edition, just published—post free.*

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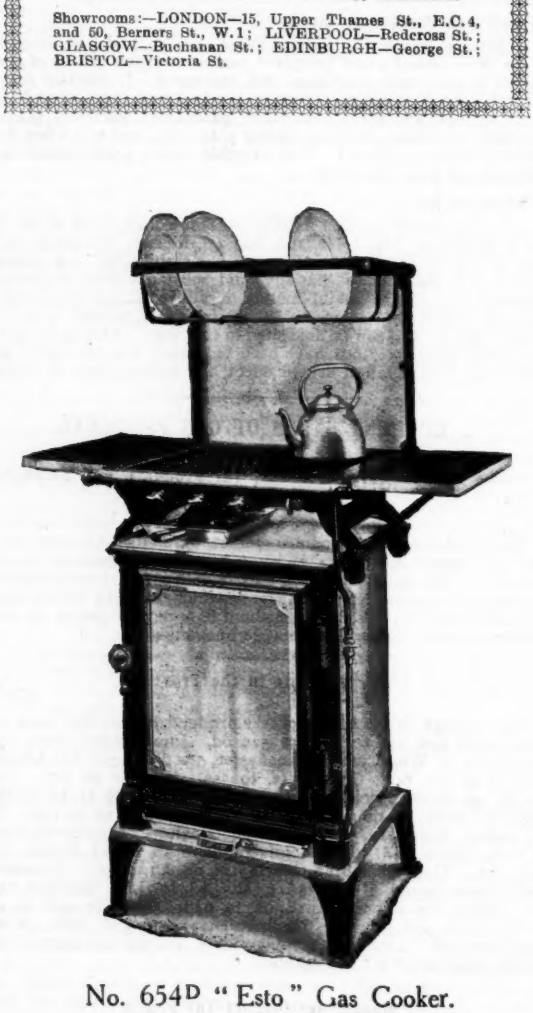

No. 654D "Esto" Gas Cooker.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Another very poor week has been experienced, and the general state of the trade may be described as distinctly unsettled, and the outlook uncertain. News from the Ruhr mines was that the troubles there were being settled, though later reports appear to point to some hitch in the negotiations. The decision of the trimmers and teemers here not to strike pending the holding of an inquiry, and the prospect of a new miners' wages agreement being concluded, albeit under protest and of a distinctly temporary nature, perhaps brought in a little more inquiry at the week-end. But new and definite business is very scarce at present, and it is very difficult to get would-be buyers up to the scratch, with so many factors of uncertainty affecting the position. Consequently many collieries are short of trade, and faced with prospects of idle time.

Good gas coal producers are still in a better position than most. Wear Specials are quoted 24s. to 24s. 6d., and best qualities 23s. to 24s., according to individual circumstances. Seconds, however, are plentiful at 21s. 6d. downwards. There are certain to be cheap odd cargoes to be had, as is always the case when collieries are near the stoppage mark. The coking coal market is dormant, and prices are a matter of negotiation.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is, as is natural at this period of the year, a falling-off in the demand for house coal in Yorkshire and Lancashire, and industrial fuel is not in urgent request, probably owing to the stocks that have been accumulated during the past few months.

In consequence of the better working of the collieries on the nearer Continent, the export requirements have not been maintained; but with a strike now in operation in Germany, further business may be brought to this country. The situation is rather uncertain, owing to some anticipation of Government control; and until this menace is out of the way, business will be rather difficult.

Gas coal remains firm, with few buyers, the majority of consumers not being in a position to make their contracts until July 1. There appears, however, to be an indication that last year's figures will then operate.

Prices at Hull at the week-end were as follows:—Bunkers: Yorks, Derby, and Notts large screened steam, f.o.b. Humber ports, 24s. to 25s. Cargo for export, f.o.b. usual shipping ports: Best Yorks hards, Association, 26s. 9d.; Derby best hards, 26s. 3d.; West Yorks Hartleys, 25s. to 27s.; South Yorks washed doubles, 26s.; South Yorks washed singles, 25s. 9d. to 26s.; dry doubles, 23s.; South Yorks washed smalls, 20s. 3d.; Derby slack, 1 in., 17s.; South Yorks rough slack, 18s. 6d.; gas coke, 37s. to 38s.; foundry furnace coke, 28s. 6d.; washed smithy peas, 28s. 6d. to 29s. 6d.; washed steam thirds, 24s. 3d. to 24s. 6d; South Yorks washed trebles, 26s. per ton.

Prices in the Lancashire market incline towards weakness. Slacks are fairly firm at 16s. to 18s. per ton at the pits. Unscreened coal is at 23s. to 23s. 6d. at the pits.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The market remains inert. A few contracts for gas coal over the New Year have been made in addition to those already mentioned. Prices vary from a shilling to half a crown above those arranged last June. Now, however, buyers are at a pause. By the time regular negotiations open for the annual contracts the new wages basis will, it is confidently believed, be settled. Consumers continue to cite the present unstable position of British industries as a clear warning that they will lose what initiative they have in the overseas markets if there is any considerable increase of the fuel bill. Steam and other works coal is in very slow sale now. The purchases made when it was feared a strike was imminent in the coalfields were more than sufficient for current requirements, and manufacturers are now carrying on very largely out of stocks and the balance of deliveries. Seasonal reductions on house coal are announced by some collieries. Dwindling arrears on gas-coal contracts still remain to be wiped out. Rapid progress is being made in this direction. It is stated, however, that in some cases it will not be possible to complete within the contract period.

There is a deadlock in the coke trade so far as contract supplies to Midland blast-furnaces are concerned. In view of the higher wages which will become payable to miners, the collieries want an advance of a shilling on contracts, making the price of 25s. at ovens. They think the trouble in the Ruhr may give a stimulus to the failing export market. Blast-furnace men refuse to submit to an advance. It would jeopardize the iron industry, they argue, in its present feeble state; and so no terms have been arranged in place of the agreement which expired on May 17. Current supplies can be obtained, at 24s.

Market Harborough Gas Affairs.—At a recent meeting of the Gas Committee of the Market Harborough Urban District Council, it was decided to send a letter of appreciation to Mr. H. Pooley for his valuable services as Consulting Engineer. The tender of the Stanton Ironworks Company, Ltd., for the supply of approximately 1800 yards of 6-in. and 4-in. cast-iron pipes, at £10 15s. and £11 per ton respectively, and specials at £22 per ton, was accepted; the pipes being required for the extension of the gas-mains in the Little Bowden Village area. Mr. P. T. Harris, the Gas Manager, reported that the recent record gas consumption was due to the prolonged cold weather, the increased output being 19 p.ct. above that for the corresponding period a year ago.

STOCK MARKET REPORT.

THE surprising results of the elections in France, following on the change in the German Government, created considerable nervousness in the Stock Market, and caused a general depression in most of the international stocks. A more optimistic impression prevailed at the end of the week, due probably to the hope that the new French Government would take a more lenient view of the reparations question.

There appears to be a good deal of money available for investment; but brokers complain that investors still require speculative interest in gilt-edged investments. There was a revival of interest in Indian Loans, which doubtless was due to the better return for the money invested as compared with other Colonial Loans.

The issue of £1,500,000 4½ p.c. debenture stock at 95¼ of the North Wales Power Company was fully subscribed, but subsequent dealings were at a small discount. Business commenced in the new 4½ p.c. Conversion Loan, and the price touched 97¾. In Home Railways, Metropolitan ordinary continued in favour, but generally the market was inactive. Iron, Coal, and Steel shares were depressed by the passing of the Vickers dividend.

Gas stocks continued to be well supported, and there was no difficulty in finding purchasers for any stock available. The transactions recorded during the week were again a little above the normal, and the changes in quotations continue in an upward direction. South Suburban ordinary and Wandsworth (Epsom) stocks showed the greatest increase, both rising 3 points.

The following transactions were recorded during the week: On Monday, Aldershot "C" 81, Brentford "B" 98⅜, 6 p.c. Richmond debenture 104½, 104¼, Cape Town and District 4½ p.c. 1st mortgage debenture 76⅜, Commercial 4 p.c. 92, 92⅜, 3½ p.c. 91, 92¼, Gas Light and Coke 94, 94⅛, 94⅜, 94½, 94⅝, 94⅞, 95, 3½ p.c. maximum 62⅜, 64, 4 p.c. preference 80⅜, Hastings and St. Leonards 3½ p.c. 79½, Imperial Continental 160, 162⅜, 162½, South Suburban 5 p.c. 99½, 100, 101, Tottenham "B" 99. Supplementary prices, Metropolitan (Melbourne) 7 5/16, South Suburban 7 p.c. debenture 104⅜. On Tuesday, Alliance and Dublin 66, Brentford "A" 99½, 99¼, Bristol 5 p.c. maximum 91, 91½, Continental Union 30, 7 p.c. preference 80, European 6½, Gas Light and Coke 94, 94⅛, 94⅜, 94⅞, 95, 3½ p.c. maximum 63⅜, 4 p.c. preference 81⅜, Hastings and St. Leonards 3½ p.c. 79½, Imperial Continental 161, 162, Montevideo 57, Primitiva 8s., 5 p.c. preference 32s., 4 p.c. 1st debenture 71½, South Metropolitan 99½, 99½, 100, 100½, Swansea 7 p.c. preference 103, Tottenham "A" 120⅜, 121⅜, "B" 100, 101, 101½, Wandsworth "C" 99½. Supplementary prices, Bournemouth 7 p.c. red. debenture 105, 105½, Wandsworth new 99½. On Wednesday, Alliance and Dublin 66⅜, Bombay 5¼, Brentford "B" 97, Bristol 92⅜, Cape Town and District 6½, Gas Light and Coke 94½, 94⅛, 94⅞, 95½, 3½ p.c. maximum 63½, 4 p.c. preference 81⅛, 81½, 3 p.c. debenture 61, Imperial Continental 161½, 162½, 163, Primitiva 8s., 5 p.c. preference 32s., South Metropolitan 99, 99½, Swansea 7 p.c. preference 103, 103⅜. On Thursday, Bombay £5 7s., Brentford "A" 99, "B" 98½, 98⅜, Commercial 4 p.c. 92, 3½ p.c. 92½, 92¾, Continental Union 7 p.c. preference 79½, European 6½, Gas Light and Coke 94⅜, 94½, 94⅝, 95, Imperial Continental 161½, Montevideo 57, Primitiva 7s. 9d., 5 p.c. preference 31s., 31s. 3d., South Suburban 5 p.c. debenture 101½, Tottenham "B" 101½, Wandsworth (Wimbledon) 111½, 112, (Epsom) 118½. Supplementary prices, Bombay "New" 5½, Malta and Mediterranean 1st (7 p.c. preference) 95s., 2nd (7½ p.c. preference) 88s. 9d. On Friday, Alliance and Dublin 66, Bahia-Blanca "A" 38. 6d., British 117½, Commercial 4 p.c. 92, 3½ p.c. 91½, 92, European 6⅜, 6⅝, Gas Light and Coke 94⅛, 94⅜, 94⅝, 4 p.c. preference 81, 3 p.c. debenture 61½, Imperial Continental 161½, Montevideo 57, Primitiva 7s. 6d., South Metropolitan 99½, 3 p.c. debenture 59, 6½ p.c. debenture 104¼, 104⅜, Southampton 86½ *ex* div. Supplementary prices, Bahia-Blanca "B" 4d., 4½d., Danish 77s. 6d.

Conditions in the Money Market at the end of the week were slightly more difficult than usual; but after 2½ p.c. had been paid for fresh advances the rate weakened, and ultimately balances were offered at 1 p.c. The Treasury Bill tenders were issued slightly above the rate for the previous week, the average being £2 19s. 2·8d. p.c.

The Foreign Exchange Market was quieter, and the rates moved within narrow limits. The following is a comparison of the rates of the principal exchanges with those of the previous week:

—	May 9.	May 16.
Dollar-sterling	4·35½–4·36⅜	4 36½– 4·36⅜
French franc	72·70–74 40	75·35 –76.60
Belgian "	88⅛–90⅜	89⅛–91⅜
Italian lire	97⅝–98⅛	98⅛–98⅜
Dutch florins	11.66–11.68½	11.65⅛–11.67½

French francs reached 80.15 on Tuesday, but recovered as the week progressed.

Silver was firmer on both Continental and Indian buying, and rose to 33 11/16d. per oz.

The Bank rate is 4 p.c., to which it was raised from 3 p.c. on July 5. Bankers' deposit rates are 2 p.c. The deposit rates of the discount houses are 2 p.c. at call and 2⅛ p.c. at notice.

Issued	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. May 16.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
131,978	Stk.	Feb. 7	5	5	Aldershot 5 p.c. max. C.	77—82	..	81
235,492	,,	,,	4	4	Do. 4 p.c. Pref.	68—73	..	..
1,551,868	,,	Apr. 3	5½	6	Alliance & Dublin Ord.	64—69	..	66—66⅜
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	60—65	..	..
280,000	5	Oct. 18	8	8	Bombay, Ltd.	5—5¼	..	5⅛—£5/7/-
100,000	10	Mar. 6	8½	8½	Bournemouth 5 p.c.	12½—13½	+½	..
383,110	10	,,	7	7	Do. B 7 p.c..	12—13	+½	..
115,000	10	,,	6	6	Do. Pref. 6 p.c..	11—12	..	..
50,000	Stk.	Dec. 28	3	3	Do. 3 p.c. Deb..	55—60	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb..	75—80	..	..
992,045	,,	Feb. 21	6 3/16	6 3/16	Brentford 'A' Con.	96—101	..	99—99½
990,500	,,	,,	6⅛	6⅛	Do. B New	96—101	..	97—98¼
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	89—94	..	..
306,690	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	76—81	..	..
181,337	,,	—	—	—	Do. 6 p.c. Rich. Red. Deb.	100—105	..	104¼—104½
214,740	,,	Mar. 6	11½	11½	Brighton & Hove Orig.	170—175	..	..
244,200	,,	,,	8½	8½	Do. A Ord.	124—127	..	..
1,287,500	,,	Feb. 21	5	5	Bristol 5 p.c. max.	90—91*a*	..	91—92⅛
855,000	,,	Mar. 20	—	7	British Ord.	117—122	..	117½
100,000	,,	—	7	7	Do. 7 p.c. Pref.	120—125	..	..
120,000	,,	Dec. 28	4	4	Do. 4 p.c. Red. Deb.	73—78	..	..
100,000	10	,,	7	6	Cape Town, Ltd.	6½—7½	..	6½
100,000	10	Apr. 24	4½	4½	Do. 4½ p.c. Pref.	6—7*	..	..
150,000	Stk.	Dec. 28	4½	4½	Do. 4½ p.c. Deb.	73—78	..	76½
626,860	,,	Feb. 21	6	6	Cardiff Con. Ord.	97—99	..	..
237,860	,,	Dec. 28	7½	7½	Do. 7½ p.c. Red. Deb.	105—110	..	..
157,150	,,	Mar. 6	5	6½	Chester 5 p.c. Ord.	88—93*b*	..	..
1,513,280	,,	,,	6	6	Commercial 4 p.c. Cap.	90—95	..	92—92⅛
560,000	,,	,,	6	6	Do. 3½ p.c. Cap.	90—95	..	91—92⅛
475,000	,,	Dec. 13	3	3	Do. 3 p.c. Deb.	57—60	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	28—33	..	30
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	75—80	..	79½—80
660,000	,,	Mar. 6	6½	6½	Croydon sliding scale	101—104	..	..
284,975	,,	,,	5	5	Do. max. div.	83—86	..	..
192,270	,,	Feb. 21	3	4½	Derby Con.	108—110*c*	..	..
55,000	,,	Jan. 12	4	4	Do. Deb.	74—76*c*	..	..
209,000	,,	Apr. 3	5	5	East Hull 5 p.c. max.	..	..	..
1,002,180	10	Jan. 24	5	2	European, Ltd.	6½—7½	..	6½—6⅝
16,503,045	Stk.	Feb. 7	5½	5½	Gas Light & Coke 4 p.c. Ord.	93½—95½	+½	94—95½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	61—64	+1	62½—64
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	79—82	..	80½—81½
4,761,930	,,	Dec. 13	3	3	Do. 3 p.c. Con. Deb.	59—62	..	61—61½
130,000	,,	Dec. 11	10	10	Do. 10 p.c. Bonds	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 20	6½	6½	Hastings & St. L. 5 p.c. Conv.	91—96	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	76—81	..	79½—79¾
70,000	10	May 8	10	10	Hongkong & China, Ltd.	16—17*	..	..
86,600	Stk.	Mar. 6	9½	10	Hornsey 7 p.c.	143—148	..	..
1,976,000	,,	Nov. 15	17	5	Imperial Continental Cap.	160—165	..	160—163
401,400	,,	Feb. 7	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	..
235,242	,,	Mar. 6	6½	6½	Lea Bridge 5 p.c. Ord.	95—100	..	..
2,127,340	,,	Feb 21	5½	5½	Liverpool 5 p.c. Ord.	90½—91½*b*	..	..
600,000	,,	Mar. 20	7	7	Do. 7 p.c. Red. Pref.	103—106*b*	..	..
165,736	,,	Feb. 21	9	8	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	Dec. 28	3	3	Do. 3 p.c. Deb.	54—59	..	..
75,000	5	Dec. 13	7	5	Malta & Mediterranean	3½—3¾	..	..
50,000	100	Apr. 1	4½	4½	Met. of Melb'rne 4½ p.c. Deb.	..	..	..
541,920	Stk.	Nov. 29	4	4	Montevideo, Ltd.	54—59	..	57
1,875,892	,,	Mar. 6	4 7/8	5½	Newcastle & Gateshead Con.	84—85*d*	..	..
250,166	,,	,,	4	4	Do. 4 p.c. Pref.	73—75*d*	..	..
529,705	,,	Dec. 28	3½	3½	Do. 3½ p.c. Deb.	71—73*d*	..	..
15,000	10	Mar. 6	11	11	North Middlesex 10 p.c.	16—17	..	..
75,940	10	,,	7 7/16	7 7/16	Do. 7 p.c.	11½—11⅝	..	..
300,000	Stk.	May 8	9	7	Oriental, Ltd.	98—101*	..	..
138,120	,,	Dec. 28	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	107—112	..	..
60,000	50	Mar. 6	13	13	Portsea Island B	102—105	..	..
100,000	50	,,	12	12	Do. C	98—103	..	..
1,450,345	5	29 Oct. 14	—	—	Primitiva Ord.	7/6—8/-	..	7/6—8/-
4,499,800	5	30 Dec. 15	—	—	Do. 5 p.c. Pref.	1⅛—1⅜	..	31/—32/-
341,400	100	Dec. 3	4	4	Do. 4 p.c. Red. Deb..	70—75	..	71½
600,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	54—57	..	..
220,335	,,	Dec. 28	4	4	Do. B. Aires 4 p.c. Rd. Db.	55—58	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	55—58	..	..
150,000	10	Mar. 20	6	6	San Paulo 6 p.c. Pref.	6—6½	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	39—41	..	..
270,000	Stk.	Mar. 20	5	5/8/4	Sheffield A	101—103*c*	..	101⅜
419,968	,,	,,	5	5/8/4	Do. B	101—103*c*	..	..
1,047,000	,,	,,	5	5/8/4	Do. C	101—103*c*	..	..
90,000	10	Oct. 18	9	6	South African	7—9	..	..
6,609,895	Stk.	Feb 21	5	6½	South Met. Ord.	99—101	+½	99—100½
102,580	,,	Jan. 10	5	5	Do. Red. Pref.	98—100	..	..
1,895,445	,,	,,	3	3	Do. 3 p.c. Deb.	57—60	..	59
734,000	,,	Mar. 6	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	104¼—104½
87,500	,,	Aug. 23	8½	8½	South Shields Con.	136—138*d*	..	..
1,687,795	,,	Feb. 21	6	6½	South Suburban Ord. 5 p.c.	100—105	+3	99½—101
368,837	,,	Dec. 28	5	5	Do. 5 p.c. Deb.	95—100	..	101⅛
647,740	,,	May 8	6	5	South'mpt'n Ord. 5 p.c. max.	84—87*	..	..
121,275	,,	Dec. 28	4	4	Do. 4 p.c. Deb.	74—79	..	..
250,000	,,	Mar. 6	7	7	Swansea 7 p.c. Red. Pref.	102—104	..	103 103⅜
200,000	,,	Dec. 28	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,000	,,	Feb. 21	8	8	Tottenham District A 5 p.c.	119—124	..	120½—121⅛
382,275	,,	,,	6½	6½	Do. B 3½ p.c.	98—103	..	99—101½
181,255	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	77—81	..	..
258,251	,,	Mar. 20	5	7/14/4	Tynemouth Con. and New	84—86*d*	..	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Mar. 6	9	9½	Wandsworth A 5 p.c.	132—137	..	..
255,636	,,	,,	7½	7½	Do. B 3½ p.c.	110—115	..	..
108,075	,,	,,	6 5/8	6/7/9	Do. C	96—101	..	99½
240,865	,,	,,	6 5/8	6/7/9	New Ordinary	..	..	99½
352,000	,,	,,	7½	7½	Wimbledon 5 p.c.	108—113	..	111½—112
98,000	,,	,,	7½	7½	Epsom 5 p.c.	115—120	+3	118½
88,116	,,	Dec. 28	3	3	3 p.c. Deb.	56—61	..	..

Quotations at:—*a*.—Bristol, *b*.—Liverpool, *c*.—Nottingham, *d*.—Newcastle, *e*.—Sheffield. * Ex. div.

L.C.C. Expenditure on Gas and Meter Testing.—The estimates of expenditure of the London County Council for the financial year 1924-25 include sums of £17,515 for gas-meter testing, and £6125 for gas testing.

Further Reduction at Redhill.—Following the reduction of two-fifths of a penny per therm on April 1, the price charged for gas by the Redhill Gas Company will be further reduced, by a similar amount, after the reading of the meters for the June quarter. The new price is only 28 p.ct. above the charge made in June, 1914.

Buckhaven Gas Scheme.—The Buckhaven and Leven Gas Commission are considering a scheme of reconstruction of the present works at Leven, or alternatively a centralization scheme of new works on a site in the Buckhaven area. The General Manager (Mr. H. A. Aitken) has estimated the cost of reconstruction at £36,000, and the new central works at £84,000.

Middlesex Gas Prices.—At a meeting of the Middlesex District Council Association, a circular addressed by the County Council to the Middlesex local authorities, on the subject of an application for an Order reducing the standard price of gas supplied by one or more of the gas companies in Middlesex, was considered; and it was decided that the constituent authorities be advised to urge the Middlesex County Council to proceed with their proposal to take action with a view to the reduction of the standard price of gas supplied by one or more of the Middlesex gas companies.

A Heavy Claim.—The hearing of the case against Baron Coppée commenced this week before the Brabant Assize Court. It may be recalled that about four years ago Baron Coppée was accused of having supplied the Germans during the war with large quantities of benzole and coal-tar products; but for various reasons the trial has been delayed. The indictment is a document of more than 150 pages, and its reading alone will occupy several sittings of the Court. It is expected that the trial will last about two months. The State is claiming from the accused Frs. 60,000,000 as damages.

Harmful Effect of Trade Disputes.—It was stated at a meeting in Bradford of the creditors of the Keighley Gas and Oil Engine Company, Ltd., that the share capital was increased in 1920, but since 1921 the Company had continually lost money. In February last, it was found that the whole of the capital had been lost. The liabilities estimated to rank for dividend were £140,248, and the deficiency £100,693. By the depreciation of foreign currency £23,385 was lost. The nineteen weeks' moulders' strike and the thirteen weeks' lock-out by the Engineering Employers' Federation weakened the financial position of the Company. The meeting appointed an Advisory Committee to act in voluntary liquidation.

Gas Fatality at Bromley.—An inquest held at Poplar last Saturday concerned the death of Annie Goulding, of Brunswick Street, Bromley, who was found dead in singular circumstances. A son of the deceased said that when he saw his mother a few days before her death she was well. When he visited the house again, witness found his mother dead on the floor. The place was full of gas, and a hissing noise indicated that it was due to a leakage at the meter. The Coroner said that there was no doubt as to the origin of the trouble—the tearing of a portion of the pipe connected with the meter at a point at which it was very thin. He thought the matter of the thin section of gas pipes at the junction with the meter required consideration by gas companies. A verdict of "Accidental death" was recorded.

Montevideo Gas and Dry Dock Company.—At next Wednesday's meeting, the Directors will report a balance at the credit of profit and loss available for dividend of £36,168. Out of this a further dividend of 2 p.ct. free of income-tax (making with the interim dividend 4 p.ct. for the year) is recommended—carrying forward a balance of £14 491. The balance at the credit of reserve account remains at £52 500, the deferred maintenance account at £15,000, and the contingency account at £17 739. Compared with the previous year, the total gas sales for 1923 show an increase of 0·63 p.ct. The number of meters in use, however, increased by 5·85 p.ct. The dock and workshops department continue to feel the effects of the depression in shipping. The sales of gas since the last issue of new capital in 1902 show an increase of 249·92 p.ct. The consumption has now outgrown the capacity of the plant, and it will become necessary to make another issue of capital to meet the cost of a further enlargement of such plant, and the provision of an additional gasholder.

Lurgan Gas Extension.—The Lurgan Urban Council, having decided to extend the gas-works, are asking the Northern Ireland Ministry of Home Affairs for sanction to a loan of £15,000 for that purpose. Mr. Wilford Tallentire, the Gas Manager, estimates the cost at £14,627. The proposed new works include a gasholder, mains, &c.

Extensions at Carlisle.—At a recent meeting of the Carlisle Corporation Gas Committee, the Town Clerk reported that he had received the sanction of the Ministry of Health to the borrowing of the sum of £11,850, in respect of extensions of gas-mains, repayable within thirty years from the date of borrowing. The Town Clerk also reported that he had received the approval of the Unemployment Grants Committee to grants of 50 p.ct. of the interest on the loans raised to meet expenditure on the above schemes not exceeding 15 years.

Gas-Works Results at Ashbourne.—Mr. L. Rose (Chairman of the Gas Commitee of the Ashbourne Urban Council) presented to the Council last week the annual balance-sheet of the gas undertaking, which showed that the capital outstanding was £55,386. The revenue account revealed a gross profit of £3554, and after payment of interest on loan and repayment of instalment of principal, a net profit of £35 remained. The gas made during the year was 47 million c.ft., an increase of over 3½ millions on the previous year. The thanks of the Council were due to Mr. H. G. Harrison (the Manager) and his staff for their effective work.

The Meter Industry in Birmingham.—At a meeting on Friday last of the Birmingham City Magistrates, Mr. Cornelius Chambers, moving the adoption of the report of the Gas-Meter Testing Committee, called attention to the general efficiency of the department. The Committee were sure all reasonable requirements of manufacturers of meters and of the local authorities of the surrounding districts were being fully met. Birmingham was an important centre for the manufacture of gas-meters, and it had been by the enterprise of Committees in the past in meeting the requirements of manufacturers that this industry had been fostered in the city. There was a time, he added, when it was probable that the industry might have drifted to other parts of the country.

The Walsall Corporation have agreed to supply gas without charge for exhibition purposes at the Staffordshire Agricultural Show, to be held at Walsall.

The Godstone District Gas Company, Ltd., announce that the price of gas will be reduced by three-fifths of a penny per therm, after the reading of the meters for the June quarter.

The Ministry of Health have sanctioned the borrowing of £1000 by the Thornton Urban District Council for the purchase of cookers; repayment to be extended over a period of ten years.

It was stated in the Nelson Town Council last week that provision had been made for reductions in electricity and gas to the extent of £14,500, equivalent to a rate of 1s. 7d. in the pound.

The Directors of the Continental Union Gas Company, Ltd., announce that an interim dividend of 3½ p.ct., less tax, will be payable on July 4 next on the preference stock, on account of the year ending June 30, 1924.

The Pembroke Joint Counties Mental Hospital have decided to enter into a provisional contract with Messrs. Gibbons Bros., Ltd., of Dibdale Works, Dudley, for the supply and erection of new gas plant for a sum of £1025.

There having already this year been several failures in connection with the local electric lighting, the Barbados Gas Company, Ltd., have opportunely, by means of a supplement to the "Barbados Advocate," drawn attention to the fact that gas has never failed there since its original installation over fifty years ago.

The Gas Committee of the Evesham Town Council have recommended that from and after June 30 next discount on charges for gas (other than penny prepayment meters), for punctual payment, be increased from the present rate of 5 p.ct. to 15 p.ct.; consumers by penny prepayment meters being allowed a discount of 1d. in the shilling as an equivalent.

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